Supplemental material for the paper:

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by

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Abstract

The supplemental material provides all the explicit formulas of integrals and MATHEMATICA codes for generating them, which are required for the implementation of the FE method presented in above the paper. The matrix elements for $\hat{T}_0$, $\hat{T}_1$, $(-\frac{Z}{x^2})$, and overlap integrals are commonly used for both the LDA and HF calculations, which are described in Secs. S-1-12. The integrals required to evaluate $V_{\rm H}(x_i)$ and $V_{\rm H}(y_i)$ of Eq. (24) in the paper are presented in Secs. S-13 and 14, which are used for the LDA calculations. The integrals associated with three basis functions which are required to evaluate Eq. (26) in the paper are provided in Secs. S-15-21. In the HF method the two electron integrals $\langle 12|34 \rangle_\lambda$ given by Eq. (55) or (58) are decomposed into the integrals D, Q, L, and R which are defined by Eqs. (56), (59), (60), and (61). All the analytic formulas of the integrals D, Q, L, and R are given in Secs. S-22. Each section consists of a brief description, MATHEMATICA code, and analytic formulas.

Contents

S-1 $\langle S_m^{(i)}|\hat{T}_0|S_n^{(i+1)}\rangle$

S-1.1 Description

Off-diagonal elements $\langle S_m^{(i)}|\hat{T}_0|S_n^{(i+1)}\rangle$ of the kinetic operator $\hat{T}_0$ between mesh points i and $(i+1)$, where $\hat{T}_0$ is defined in Eq. (4) in the paper.

S-1.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m = 0, m <= 1, ++m,
  For[n = 0, n <= 1, ++n,
   Print["m=", m, " ", "n=", n, " ",
   Simplify[
     Integrate[
       S[m, (x - i*d)/d]*(-1/8/x^2)*D[D[(-1)^n*S[n, -(x - (i + 1)*d)/d], x],
         x]*2*x^5 + S[m, (x - i*d)/d]*(-3/8/x^3)*
         D[(-1)^n*S[n, -(x - (i + 1)*d)/d], x]*2*x^5, {x, i*d, (i + 1)*d}]]
       ]
  ]
]
```

S-1.3 Analytic formulas

m=0, n=0,

$$-\frac{3}{280}d^2\left(5 + 24i + 42i^2 + 28i^3\right)$$

m=0, n=1,

$$\frac{1}{560}d^2\left(-5 - 12i + 14i^3\right)$$

m=1, n=0,

$$-\frac{1}{560}d^2\left(7 + 30i + 42i^2 + 14i^3\right)$$

m=1, n=1,

$$-\frac{d^2\left(11 + 36i + 42i^2 + 28i^3\right)}{3360}$$

S-2 $\quad \langle S_m^{(i)}|\hat{T}_0|S_n^{(i)}\rangle\,,(i\neq 0)$

S-2.1 $\quad$ Description

Diagonal elements $\langle S_m^{(i)}|\hat{T}_0|S_n^{(i)}\rangle$ of the kinetic operator $\hat{T}_0$ at a mesh point $i(i\neq 0)$, where $\hat{T}_0$ is defined in Eq. (4) in the paper.

S-2.2 $\quad$ MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[
        Integrate[(-1)^m*S[m,-(x-i*d)/d]*(-1/8/x^2)*D[
          D[(-1)^n*S[n,-(x-i*d)/d],x] ,x]*2*x^5+(-1)^m*S[m,-(x-i*d)/
            d]*(-3/8/x^3)*D[(-1)^n*S[n,-(x-i*d)/d],
                x]*2*x^5,{x,i*d-d,i*d}]+Integrate[S[m,(x-i*d)/d]*(-1/
                8/x^2)*D[D[S[n,(x-i*d)/d],x] ,x]*2*x^5+S[m,(x-i*d)/d]*(-3/
                8/x^3)*D[S[n,(x-i*d)/d],x]*2*x^5,{x,i*d,i*d+d}]]
        ]
  ]
]
```

S-2.3 $\quad$ Analytic formulas

m=0, n=0,

$$\frac{3}{35}d^2 i\left(6+7i^2\right)$$

m=0, n=1,

$$\frac{1}{40}d^2\left(1+6i^2\right)$$

m=1, n=0,

$$\frac{1}{40}d^2\left(1+6i^2\right)$$

m=1, n=1,

$$\frac{1}{105}d^2 i\left(3+7i^2\right)$$

S-3 $\langle S_m^{(i)}|\hat{T}_0|S_n^{(i)}\rangle , (i = 0)$

S-3.1 Description

Diagonal elements $\langle S_m^{(i)}|\hat{T}_0|S_n^{(i)}\rangle$ of the kinetic operator $\hat{T}_0$ at the mesh point $i = 0$, where $\hat{T}_0$ is defined in Eq. (4) in the paper.

S-3.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[
        Integrate[(-1)^m*S[m,-(x-i*d)/d]*(-1/8/x^2)*D[
          D[(-1)^n*S[n,-(x-i*d)/d],x] ,x]*2*x^5+(-1)^m*S[m,-(x-i*d)/
            d]*(-3/8/x^3)*D[(-1)^n*S[n,-(x-i*d)/d],
                x]*2*x^5,{x,i*d-d,i*d}]+Integrate[S[m,(x-i*d)/d]*(-1/
                8/x^2)*D[D[S[n,(x-i*d)/d],x] ,x]*2*x^5+S[m,(x-i*d)/d]*(-3/
                8/x^3)*D[S[n,(x-i*d)/d],x]*2*x^5,{x,i*d,i*d+d}]]
      ]
  ]
]
```

S-3.3 Analytic formulas

m=0, n=0,

$$\frac{15}{280}d^2$$

m=0, n=1,

$$\frac{7}{560}d^2$$

m=1, n=0,

$$\frac{7}{560}d^2$$

m=1, n=1,

$$\frac{11}{3360}d^2$$

S-4 $\qquad \langle S_m^{(i)}|\hat{T}_1|S_n^{(i+1)}\rangle$

S-4.1 Description

Off-diagonal elements $\langle S_m^{(i)}|\hat{T}_1|S_n^{(i+1)}\rangle$ of the kinetic operator $\hat{T}_1$ between mesh points i and $(i+1)$, where $\hat{T}_1$ is defined in Eq. (5) in the paper.

S-4.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"     ",
      Integrate[S[m,(x-i*d)/d]*(-1)^n*S[n,-(x-(i+1)*d)/d]
                *(l*(l+1)/(2*x^4))*2*x^5,{x,i*d,(i+1)*d}]
    ]
  ]
]
```

S-4.3 Analytic formulas

m=0, n=0,

$$\frac{9}{140}d^2(1+2i)l(1+l)$$

m=0, n=1,

$$-\frac{1}{420}d^2(6+13i)l(1+l)$$

m=1, n=0,

$$\frac{1}{420}d^2(7+13i)l(1+l)$$

m=1, n=1,

$$-\frac{1}{280}d^2(1+2i)l(1+l)$$

S-5 $\quad \langle S_m^{(i)}|\hat{T}_1|S_n^{(i)}\rangle , (i \neq 0)$

S-5.1   Description

Diagonal elements $\langle S_m^{(i)}|\hat{T}_0|S_n^{(i)}\rangle$ of the kinetic operator $\hat{T}_0$ at a mesh point $i(i \neq 0)$, where $\hat{T}_1$ is defined in Eq. (5) in the paper.

S-5.2   MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[Integrate[(-1)^m*S[m,-(x-i*d)/d]*(-1)^n
        *S[n,-(x-i*d)/d]*(l*(l+1)/(2*x^4))*2*x^5,{x,i*d-d,i*d}]+
            Integrate[S[m,(x-i*d)/d]
        *S[n,(x-i*d)/d]*(l*(l+1)/(2*x^4))*2*x^5,{x,i*d,i*d+d}]]
    ]
  ]
]
```

S-5.3   Analytic formulas

m=0, n=0,

$$\frac{26}{35}d^2 i l(1+l)$$

m=0, n=1,

$$\frac{1}{30}d^2 l(1+l)$$

m=1, n=0,

$$\frac{1}{30}d^2 l(1+l)$$

m=1, n=1,

$$\frac{2}{105}d^2 i l(1+l)$$

S-6 $\langle S_m^{(i)}|\hat{T}_1|S_n^{(i)}\rangle$, $(i=0)$

S-6.1 Description

Diagonal elements $\langle S_m^{(i)}|\hat{T}_1|S_n^{(i)}\rangle$ of the kinetic operator $\hat{T}_1$ at the mesh point $i=0$, where $\hat{T}_1$ is defined in Eq. (5) in the paper.

S-6.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Integrate[S[m,(x-i*d)/d]*S[n,(x-i*d)/d]*(l*(l+1)/(2*x^4))*2*x^5,
              {x,i*d,i*d+d}]
    ]
  ]
]
```

S-6.3 Analytic formulas

m=0, n=0,

$$\frac{3}{35}d^2l(1+l)$$

m=0, n=1,

$$\frac{7}{420}d^2l(1+l)$$

m=1, n=0,

$$\frac{7}{420}d^2l(1+l)$$

m=1, n=1,

$$\frac{3}{840}d^2l(1+l)$$

S-7 $\qquad \langle S_m^{(i)}|(-\frac{Z}{x^2})|S_n^{(i+1)}\rangle$

S-7.1 Description

Off-diagonal elements $\langle S_m^{(i)}|(-\frac{Z}{x^2})|S_n^{(i+1)}\rangle$ of the operator $(-\frac{Z}{x^2})$ between mesh points i and $(i+1)$.

S-7.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[Integrate[S[m,(x-i*d)/d]*(-1)^n*S[n,-(x-i*d-d)/d]
              *(-Z/x^2)*2*x^5,{x,i*d,i*d+d}]]
    ]
  ]
]
```

S-7.3 Analytic formulas

m=0, n=0,

$$-\frac{1}{420}d^4\left(19+92i+162i^2+108i^3\right)Z$$

m=0, n=1,

$$\frac{d^4\left(11+57i+108i^2+78i^3\right)Z}{1260}$$

m=1, n=0,

$$-\frac{d^4\left(16+75i+126i^2+78i^3\right)Z}{1260}$$

m=1, n=1,

$$\frac{1}{420}d^4\left(1+5i+9i^2+6i^3\right)Z$$

S-8 $\langle S_m^{(i)}|(-\frac{Z}{x^2})|S_n^{(i)}\rangle, (i \neq 0)$

S-8.1 Description

Diagonal elements $\langle S_m^{(i)}|(-\frac{Z}{x^2})|S_n^{(i+1)}\rangle$ of the operator $(-\frac{Z}{x^2})$ at a mesh point $i(i \neq 0)$.

S-8.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[Integrate[(-1)^m*S[m,-(x-i*d)/d]*(-1)^n
            *S[n,-(x-i*d)/d]*(-Z/x^2)*2*x^5,
              {x,i*d-d,i*d}]
             +Integrate[S[m,(x-i*d)/d]*S[n,(x-i*d)/d]*(-Z/x^2)*2*x^5,
              {x,i*d,i*d+d}]]
    ]
  ]
]
```

S-8.3 Analytic formulas

m=0, n=0,

$$-\frac{2}{105}d^4 i\left(19 + 78i^2\right) Z$$

m=0, n=1,

$$-\frac{1}{315}d^4\left(4 + 63i^2\right) Z$$

m=1, n=0,

$$-\frac{1}{315}d^4\left(4 + 63i^2\right) Z$$

m=1, n=1,

$$-\frac{2}{105}d^4 i\left(1 + 2i^2\right) Z$$

S-9 $\langle S_m^{(i)}|(-\frac{Z}{x^2})|S_n^{(i)}\rangle , (i=0)$

S-9.1   Description

Diagonal elements $\langle S_m^{(i)}|(-\frac{Z}{x^2})|S_n^{(i+1)}\rangle$ of the operator $(-\frac{Z}{x^2})$ at the mesh point $i(i=0)$.

S-9.2   MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[Integrate[S[m,(x-i*d)/d]*S[n,(x-i*d)/d]*(-Z/x^2)*2*x^5,
               {x,i*d,i*d+d}]]]
    ]
  ]
]
```

S-9.3   Analytic formulas

m=0, n=0,

$$-\frac{11Zd^4}{420}$$

m=0, n=1,

$$-\frac{8d^4Z}{1260}$$

m=1, n=0,

$$-\frac{8d^4Z}{1260}$$

m=1, n=1,

$$-\frac{2d^4Z}{1260}$$

S-10 $\quad \langle S_m^{(i)}|S_n^{(i+1)}\rangle$

S-10.1 Description

Off-diagonal overlap elements $\langle S_m^{(i)}|S_n^{(i+1)}\rangle$ between mesh points i and $(i+1)$.

S-10.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[Integrate[S[m,(x-i*d)/d]*(-1)^n*S[n,-(x-i*d-d)/d] *2*x^5,
               {x,i*d,i*d+d}]]
    ]
  ]
]
```

S-10.3 Analytic formulas

m=0, n=0,

$$\frac{d^6(1+2i)(287+22i(1+i)(68+81i(1+i)))}{13860}$$

m=0, n=1,

$$-\frac{d^6\left(49+375i+1210i^2+2090i^3+1980i^4+858i^5\right)}{13860}$$

m=1, n=0,

$$\frac{d^6\left(84+595i+1760i^2+2750i^3+2310i^4+858i^5\right)}{13860}$$

m=1, n=1,

$$-\frac{d^6(1+2i)(14+11i(1+i)(7+9i(1+i)))}{13860}$$

S-11 $\quad \langle S_m^{(i)} | S_n^{(i)} \rangle , (i \neq 0)$

S-11.1 Description

Diagonal overlap elements $\langle S_m^{(i)} | S_n^{(i)} \rangle$ at a mesh point $i(i \neq 0)$.

S-11.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"    ","n=",n,"    ",
      Simplify[Integrate[(-1)^m*S[m,-(x-i*d)/d]*(-1)^n*S[n,-(x-i*d)/d]*2*x^5,
               {x,i*d-d,i*d}]
               +
               Integrate[S[m,(x-i*d)/d]*S[n,(x-i*d)/d]*2*x^5,{x,i*d,i*d+d}]]]
    ]
  ]
]
```

S-11.3 Analytic formulas

m=0, n=0,

$$\frac{2d^6 i \left(225 + 2090 i^2 + 2574 i^4 \right)}{3465}$$

m=0, n=1,

$$\frac{d^6 \left(13 + 440 i^2 + 1155 i^4 \right)}{3465}$$

m=1, n=0,

$$\frac{d^6 \left(13 + 440 i^2 + 1155 i^4 \right)}{3465}$$

m=1, n=1,

$$\frac{2d^6 i \left(15 + 110 i^2 + 66 i^4 \right)}{3465}$$

S-12 $\langle S_m^{(i)} | S_n^{(i)} \rangle , (i = 0)$

S-12.1 Description

Diagonal overlap elements $\langle S_m^{(i)} | S_n^{(i)} \rangle$ at the mesh point $i(i = 0)$.

S-12.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    Print["m=",m,"   ","n=",n,"    ",
      Simplify[Integrate[S[m,(x-i*d)/d]*S[n,(x-i*d)/d]*2*x^5,
              {x,i*d,(i+1)*d}]]
    ]
  ]
]
```

S-12.3 Analytic formulas

m=0, n=0,

$$\frac{49d^6}{6930}$$

m=0, n=1,

$$\frac{13d^6}{6930}$$

m=1, n=0,

$$\frac{13d^6}{6930}$$

m=1, n=1,

$$\frac{7d^6}{13860}$$

S-13   Integrals in Eq. (24) to evaluate $V_{\mathrm{H}}(x_i)$

S-13.1   Description

By inserting Eq. (21) into Eq. (24), $V_{\mathrm{H}}(x_i)$ given by Eq. (24) are analytically evaluated as follows:

$$
\begin{aligned}
V_{\mathrm{H}}(x_i) &= \frac{8\pi}{x_i^2} \int_0^{x_i} n(x)x^5 dx + 8\pi \int_{x_i}^{\infty} n(x)x^3 dx, \\
&= \frac{8\pi}{x_i^2} a_0 A_1 + \frac{8\pi}{x_i^2} b_0 B_1 + \frac{8\pi}{x_i^2} \sum_{k=1}^{i-1} a_k A_{2,k} + \frac{8\pi}{x_i^2} \sum_{k=1}^{i-1} b_k B_{2,k} + \frac{8\pi}{x_i^2} a_i A_3 + \frac{8\pi}{x_i^2} b_i B_3 \\
&\quad + 8\pi a_i A_4 + 8\pi b_i B_4 + 8\pi \sum_{k=i+1}^{N-1} a_k A_{5,k} + 8\pi \sum_{k=i+1}^{N-1} b_k B_{5,k},
\end{aligned}
$$

where

$$
A_1 = \int_0^d S_0^{(0)}\left(\frac{x - x_0}{d}\right)x^5 dx,
$$

$$
B_1 = \int_0^d S_1^{(0)}\left(\frac{x - x_0}{d}\right)x^5 dx,
$$

$$
A_{2,k} = \int_{(k-1)d}^{(k+1)d} S_0^{(k)}\left(\frac{x - x_k}{d}\right)x^5 dx,
$$

$$
B_{2,k} = \int_{(k-1)d}^{(k+1)d} S_1^{(k)}\left(\frac{x - x_k}{d}\right)x^5 dx,
$$

$$
A_3 = \int_{(i-1)d}^{id} S_0^{(i)}\left(\frac{x - x_i}{d}\right)x^5 dx,
$$

$$
B_3 = \int_{(i-1)d}^{id} S_1^{(i)}\left(\frac{x - x_i}{d}\right)x^5 dx,
$$

$$
A_4 = \int_{id}^{(i+1)d} S_0^{(i)}\left(\frac{x - x_i}{d}\right)x^3 dx,
$$

$$
B_4 = \int_{id}^{(i+1)d} S_1^{(i)}\left(\frac{x - x_i}{d}\right)x^3 dx,
$$

$$
A_{5,k} = \int_{(k-1)d}^{(k+1)d} S_0^{(k)}\left(\frac{x - x_k}{d}\right)x^3 dx,
$$

$$
B_{5,k} = \int_{(k-1)d}^{(k+1)d} S_1^{(k)}\left(\frac{x - x_k}{d}\right)x^3 dx.
$$

The analytic formulas of all the integrals A_1, B_1, $A_{2,k}$, $B_{2,k}$, A_3, B_3, A_4, B_4, $A_{5,k}$, and $B_{5,k}$ are found as shown below:

S-13.2   Mathematica code

```
(* Definition of the FE basis functions *)
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

(* A_1 *)
Integrate[S[0,(x-0*d)/d]*x^5 ,{x,0,d}]

(* B_1 *)
Integrate[S[1,(x-0*d)/d]*x^5 ,{x,0,d}]

(* A_{2,k} *)
Simplify[Integrate[S[0,-(x-k*d)/d]*x^5 ,{x,(k-1)*d,k*d}]
        +Integrate[S[0,(x-k*d)/d]*x^5 ,{x,k*d,(k+1)*d}]]

(* B_{2,k} *)
Simplify[Integrate[-S[1,-(x-k*d)/d]*x^5 ,{x,(k-1)*d,k*d}]
        +Integrate[ S[1,(x-k*d)/d]*x^5 ,{x,k*d,(k+1)*d}]]

(* A_3 *)
Simplify[Integrate[S[0,-(x-i*d)/d]*x^5 ,{x,(i-1)*d,i*d}]]

(* B_3 *)
Simplify[Integrate[-S[1,-(x-i*d)/d]*x^5 ,{x,(i-1)*d,i*d}]]

(* A_4 *)
Simplify[Integrate[S[0,(x-i*d)/d]*x^3 ,{x,i*d,(i+1)*d}]]

(* B_4 *)
Simplify[Integrate[S[1,(x-i*d)/d]*x^3 ,{x,i*d,(i+1)*d}]]

(* A_{5,k} *)
Simplify[Integrate[S[0,-(x-k*d)/d]*x^3,{x,(k-1)*d,k*d}]
        +Integrate[S[0,(x-k*d)/d]*x^3 ,{x,k*d,(k+1)*d}]]

(* B_{5,k} *)
Simplify[Integrate[-S[1,-(x-k*d)/d]*x^3,{x,(k-1)*d,k*d}]
        +Integrate[S[1,(x-k*d)/d]*x^3 ,{x,k*d,(k+1)*d}]]
```

S-13.3   Analytic formulas

$$A_1 = \frac{d^6}{72}$$

$$B_1 = \frac{d^6}{252}$$

$$A_{2,k} = \frac{1}{42}d^6 k \left(9 + 56k^2 + 42k^4\right)$$

$$B_{2,k} = \frac{1}{126}d^6 \left(1 + 24k^2 + 42k^4\right)$$

$$A_3 = \frac{1}{504}d^6 \left(-7 + 54i - 180i^2 + 336i^3 - 378i^4 + 252i^5\right)$$

$$B_3 = \frac{1}{504}d^6 \left(2 - 15i + 48i^2 - 84i^3 + 84i^4 - 42i^5\right)$$

$$A_4 = \frac{1}{140} d^4 \left(5 + 28i + 63i^2 + 70i^3 \right)$$

$$B_4 = \frac{1}{420} d^4 \left(4 + 21i + 42i^2 + 35i^3 \right)$$

$$A_{5,k} = \frac{1}{5} d^4 k \left(2 + 5k^2 \right)$$

$$B_{5,k} = \frac{1}{105} d^4 \left(2 + 21k^2 \right)$$

S-14 Integrals in Eq. (24) to evaluate $V_{\mathrm{H}}(y_i)$

S-14.1 Description

By inserting Eq. (21) into the corresponding analog of Eq. (24), $V_{\mathrm{H}}(y_i)$ are analytically evaluated as follows:

$$
\begin{aligned}
V_{\mathrm{H}}(y_i) &= \frac{8\pi}{y_i^2}\int_0^{y_i} n(x)x^5 dx + 8\pi\int_{x_i}^{\infty} n(x)x^3 dx, \\
&= \frac{8\pi}{y_i^2}a_0 C_0 \delta_{i0} + \frac{8\pi}{y_i^2}b_0 D_0 \delta_{i0} + \frac{8\pi}{y_i^2}a_0 C_1(1-\delta_{i0}) + \frac{8\pi}{y_i^2}b_0 D_1(1-\delta_{i0}) + \frac{8\pi}{y_i^2}\sum_{k=1}^{i-1}a_k C_{2,k} + \frac{8\pi}{y_i^2}\sum_{k=1}^{i-1}b_k D_{2,k} \\
&\quad + \frac{8\pi}{y_i^2}a_i C_3(1-\delta_{i0}) + \frac{8\pi}{y_i^2}b_i D_3(1-\delta_{i0}) + 8\pi a_i C_4 + 8\pi b_i D_4 + \frac{8\pi}{y_i^2}a_{i+1}C_5 + \frac{8\pi}{y_i^2}b_{i+1}D_5 \\
&\quad + 8\pi a_{i+1}C_6 + 8\pi b_{i+1}D_6 + 8\pi\sum_{k=i+2}^{N-1}a_k C_{7,k} + 8\pi\sum_{k=i+2}^{N-1}b_k B_{7,k},
\end{aligned}
$$

where

$$
C_0 = \int_0^{d/2} S_0^{(0)}(\frac{x-x_0}{d})x^5 dx,
$$

$$
D_0 = \int_0^{d/2} S_1^{(0)}(\frac{x-x_0}{d})x^5 dx,
$$

$$
C_1 = \int_0^{d} S_0^{(0)}(\frac{x-x_0}{d})x^5 dx,
$$

$$
D_1 = \int_0^{d} S_1^{(0)}(\frac{x-x_0}{d})x^5 dx,
$$

$$
C_{2,k} = \int_{(k-1)d}^{(k+1)d} S_0^{(k)}(\frac{x-x_k}{d})x^5 dx,
$$

$$
D_{2,k} = \int_{(k-1)d}^{(k+1)d} S_1^{(k)}(\frac{x-x_k}{d})x^5 dx,
$$

$$
C_3 = \int_{(i-1)d}^{(2i+1)d/2} S_0^{(i)}(\frac{x-x_i}{d})x^5 dx,
$$

$$
D_3 = \int_{(i-1)d}^{(2i+1)d/2} S_1^{(i)}(\frac{x-x_i}{d})x^5 dx,
$$

$$
C_4 = \int_{(2i+1)d/2}^{(i+1)d} S_0^{(i)}(\frac{x-x_i}{d})x^3 dx,
$$

$$
D_4 = \int_{(2i+1)d/2}^{(i+1)d} S_1^{(i)}(\frac{x-x_i}{d})x^3 dx,
$$

$$
C_5 = \int_{d}^{(2i+1)d/2} S_0^{(i+1)}(\frac{x-x_{i+1}}{d})x^5 dx,
$$

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$$D_5 = \int_d^{(2i+1)d/2} S_1^{(i+1)}(\frac{x - x_{i+1}}{d})x^5 dx,$$

$$C_6 = \int_{(2i+1)d/2}^{(i+2)d} S_0^{(i+1)}(\frac{x - x_{i+1}}{d})x^3 dx,$$

$$D_6 = \int_{(2i+1)d/2}^{(i+2)d} S_1^{(i+1)}(\frac{x - x_{i+1}}{d})x^3 dx,$$

$$C_{7,k} = \int_{(k-1)d}^{(k+1)d} S_0^{(k)}(\frac{x - x_k}{d})x^3 dx,$$

$$D_{7,k} = \int_{(k-1)d}^{(k+1)d} S_1^{(k)}(\frac{x - x_k}{d})x^3 dx,$$

The analytic formulas of all the integrals C_0, D_0, C_1, D_1, $C_{2,k}$, $D_{2,k}$, C_3, D_3, C_4, D_4, C_5, D_5, C_6, D_6, $C_{7,k}$, and $D_{7,k}$ are found as shown below:

S-14.2   MATHEMATICA code

```
(* Definition of the FE basis functions *)
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

(* C_0 *)
Integrate[S[0,(x-0*d)/d]*x^5 ,{x,0,d/2}]

(* D_0 *)
Integrate[S[1,(x-0*d)/d]*x^5 ,{x,0,d/2}]

(* C_1 *)
Integrate[S[0,(x-0*d)/d]*x^5 ,{x,0,d}]

(* D_1 *)
Integrate[S[1,(x-0*d)/d]*x^5 ,{x,0,d}]

(* C_{2,k} *)
Simplify[Integrate[S[0,-(x-k*d)/d]*x^5 ,{x,(k-1)*d,k*d}]
       +Integrate[S[0,(x-k*d)/d]*x^5 ,{x,k*d,(k+1)*d}]]

(* D_{2,k} *)
Simplify[Integrate[-S[1,-(x-k*d)/d]*x^5 ,{x,(k-1)*d,k*d}]
       +Integrate[S[1,(x-k*d)/d]*x^5 ,{x,k*d,(k+1)*d}]]

(* C_3 *)
Simplify[Integrate[S[0,-(x-i*d)/d]*x^5, {x,(2*i-2)*d/2,2*i*d/2}]
       +Integrate[S[0,(x-i*d)/d]*x^5 ,{x,2*i*d/2,(2*i+1)*d/2}]]

(* D_3 *)
Simplify[Integrate[-S[1,-(x-i*d)/d]*x^5 ,{x,(2*i-2)*d/2,2*i*d/2}]
       +Integrate[ S[1,(x-i*d)/d]*x^5 ,{x,2*i*d/2,(2*i+1)*d/2}]]

(* C_4 *)
```

```
Simplify[Integrate[S[0,(x-i*d)/d]*x^3 ,{x,(2*i+1)*d/2,(2*i+2)*d/2}]]

(* D_4 *)
Simplify[Integrate[S[1,(x-i*d)/d]*x^3 ,{x,(2*i+1)*d/2,(2*i+2)*d/2}]]

(* C_5 *)
Simplify[Integrate[S[0,-(x-(i+1)*d)/d]*x^5 ,{x,2*i*d/2,(2*i+1)*d/2}]]

(* D_5 *)
Simplify[Integrate[-S[1,-(x-(i+1)*d)/d]*x^5 ,{x,2*i*d/2,(2*i+1)*d/2}]]

(* C_6 *)
Simplify[Integrate[S[0,-(x-(i+1)*d)/d]*x^3 ,{x,(2*i+1)*d/2,(2*i+2)*d/2}]
        +Integrate[S[0,(x-(i+1)*d)/d]*x^3 ,{x,(2*i+2)*d/2,(2*i+4)*d/2}]]

(* D_6 *)
Simplify[Integrate[-S[1,-(x-(i+1)*d)/d]*x^3 ,{x,(2*i+1)*d/2,(2*i+2)*d/2}]
        +Integrate[S[1,(x-(i+1)*d)/d]*x^3 ,{x,(2*i+2)*d/2,(2*i+4)*d/2}]]

( C_{7,k} *)
Simplify[Integrate[S[0,-(x-k*d)/d]*x^3,{x,(k-1)*d,k*d}]
        +Integrate[S[0,(x-k*d)/d]*x^3 ,{x,k*d,(k+1)*d}]]

( * D_{7,k} *)
Simplify[Integrate[-S[1,-(x-k*d)/d]*x^3,{x,(k-1)*d,k*d}]
        +Integrate[S[1,(x-k*d)/d]*x^3 ,{x,k*d,(k+1)*d}]]
```

S-14.3   Analytic formulas

$$C_0 = \frac{29d^6}{18432}$$

$$D_0 = \frac{23d^6}{64512}$$

$$C_1 = \frac{d^6}{72}$$

$$D_1 = \frac{d^6}{252}$$

$$C_{2,k} = \frac{1}{42}d^6 k \left(9 + 56k^2 + 42k^4\right)$$

$$D_{2,k} = \frac{1}{126}d^6 \left(1 + 24k^2 + 42k^4\right)$$

$$C_3 = \frac{d^6 \left(-1589 + 16326i - 33120i^2 + 122304i^3 - 38304i^4 + 116928i^5\right)}{129024}$$

$$D_3 = \frac{d^6 \left(186 - 1095i + 5024i^2 - 4704i^3 + 10752i^4 - 1120i^5\right)}{43008}$$

$$C_4 = \frac{d^4 \left(115 + 518i + 798i^2 + 420i^3\right)}{4480}$$

$$D_4 = \frac{d^4 \left(99 + 441i + 672i^2 + 350i^3\right)}{13440}$$

$$C_5 = \frac{d^6 \left(133 + 1530i + 7200i^2 + 17472i^3 + 22176i^4 + 12096i^5\right)}{129024}$$

$$D_5 = -\frac{d^6 \left(35 + 405i + 1920i^2 + 4704i^3 + 6048i^4 + 3360i^5\right)}{129024}$$

$$C_6 = \frac{d^4 \left(6247 + 15050i + 12978i^2 + 4060i^3\right)}{4480}$$

$$D_6 = \frac{d^4 \left(2964 + 5523i + 3066i^2 + 350i^3\right)}{13440}$$

$$C_{7,k} = \frac{1}{5}d^4 k \left(2 + 5k^2\right)$$

$$D_{7,k} = \frac{1}{105}d^4 \left(2 + 21k^2\right)$$

S-15 $\langle S_m^{(0)}|S_p^{(0)}|S_n^{(0)}\rangle$

S-15.1 Description

The integrals appearing in Eq. (26) in the paper, where $S_m^{(0)}$, $S_n^{(0)}$, and $S_p^{(0)}$ are all located in the mesh point $i = 0$.

S-15.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    For[p=0, p<=1, ++p,
      Print["m=",m,"   ","n=",n,"   ","p=",p,"   ",
        Simplify[
          Integrate[ S[m,(x-0*d)/d]*S[n,(x-0*d)/d]
                     *S[p,(x-0*d)/d]*2*x^5,{x,0*d,(0+1)*d}]]
        ]
      ]
    ]
  ]
]
```

S-15.3 Analytic formulas

m=0, n=0, p=0,

$$\frac{163d^6}{60060}$$

m=0, n=0, p=1,

$$\frac{61d^6}{90090}$$

m=0, n=1, p=0,

$$\frac{61d^6}{90090}$$

m=0, n=1, p=1,

$$\frac{31d^6}{180180}$$

m=1, n=0, p=0,

$$\frac{61d^6}{90090}$$

m=1, n=0, p=1,

$$\frac{31d^6}{180180}$$

m=1, n=1, p=0,

$$\frac{31d^6}{180180}$$

m=1, n=1, p=1,

$$\frac{2d^6}{45045}$$

S-16 $\quad \langle S_m^{(0)}|S_p^{(1)}|S_n^{(0)}\rangle$

S-16.1 Description

The integrals appearing in Eq. (26) in the paper, where $S_m^{(0)}$ and $S_n^{(0)}$ are located in the mesh point $i = 0$, and $S_p^{(1)}$ is located in the mesh point $i = 1$.

S-16.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    For[p=0, p<=1, ++p,
      Print["m=",m,"    ","n=",n,"    ","p=",p,"    ",
        Simplify[
          Integrate[S[m,(x-0*d)/d]*S[n,(x-0*d)/d]
                    *(-1)^p*S[p,-(x-1*d)/d]*2*x^5,
                    {x,0*d,(0+1)*d}]]
        ]
      ]
    ]
  ]
]
```

S-16.3 Analytic formulas

m=0, n=0, p=0,
$$\frac{157d^6}{36036}$$
m=0, n=0, p=1,
$$-\frac{163d^6}{180180}$$
m=0, n=1, p=0,
$$\frac{6d^6}{5005}$$
m=0, n=1, p=1,
$$-\frac{d^6}{4095}$$
m=1, n=0, p=0,
$$\frac{6d^6}{5005}$$
m=1, n=0, p=1,
$$-\frac{d^6}{4095}$$
m=1, n=1, p=0,
$$\frac{d^6}{3003}$$
m=1, n=1, p=1,
$$-\frac{d^6}{15015}$$

S-17 $\langle S_m^{(i)}|S_p^{(i)}|S_n^{(i)}\rangle\,,(i\neq 0)$

S-17.1 Description

The integrals appearing in Eq. (26) in the paper, where $S_m^{(0)}$, $S_n^{(0)}$, and $S_p^{(0)}$ are all located in a mesh point $i(i\neq 0)$.

S-17.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    For[p=0, p<=1, ++p,
      Print["m=",m,"    ","n=",n,"    ","p=",p,"    ",
        Simplify[
          Integrate[(-1)^m*S[m,-(x-i*d)/d]*(-1)^n*S[n,-(x-i*d)/d]
                  *(-1)^p*S[p,-(x-i*d)/d]*2*x^5,{x,(i-1)*d,i*d}]
                  +
          Integrate[S[m,(x-i*d)/d]*S[n,(x-i*d)/d]*S[p,(x-i*d)/d]*2*x^5,
                  {x,i*d,(i+1)*d}]
        ]
      ]
    ]
  ]
]
```

S-17.3 Analytic formulas

m=0, n=0, p=0,

$$\frac{d^6 i\left(855+10660i^2+18447i^4\right)}{15015}$$

m=0, n=0, p=1,

$$\frac{d^6\left(61+2680i^2+9425i^4\right)}{45045}$$

m=0, n=1, p=0,

$$\frac{d^6\left(61+2680i^2+9425i^4\right)}{45045}$$

m=0, n=1, p=1,

$$\frac{2d^6 i\left(75+715i^2+572i^4\right)}{45045}$$

m=1, n=0, p=0,

$$\frac{d^6\left(61+2680i^2+9425i^4\right)}{45045}$$

m=1, n=0, p=1,

$$\frac{2d^6 i\left(75+715i^2+572i^4\right)}{45045}$$

m=1, n=1, p=0,

$$\frac{2d^6 i \left(75 + 715i^2 + 572i^4\right)}{45045}$$

m=1, n=1, p=1,

$$\frac{2d^6 \left(2 + 75i^2 + 195i^4\right)}{45045}$$

S-18 $\langle S_m^{(i)} | S_p^{(i-1)} | S_n^{(i)} \rangle$, $(i \neq 0)$

S-18.1 Description

The integrals appearing in Eq. (26) in the paper, where $S_m^{(i)}$ and $S_n^{(i)}$ are located in a mesh point $i(i \neq 0)$, and $S_p^{(i-1)}$ is located in a mesh point $(i-1)$.

S-18.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    For[p=0, p<=1, ++p,
      Print["m=",m,"    ","n=",n,"    ","p=",p,"    ",
        Simplify[
          Integrate[(-1)^m*S[m,-(x-i*d)/d]*(-1)^n*S[n,-(x-i*d)/d]
                    *S[p,(x-(i-1)*d)/d]*2*x^5,{x,(i-1)*d,i*d}]
        ]
      ]
    ]
  ]
]
```

S-18.3 Analytic formulas

m=0, n=0, p=0,
$$\frac{d^6\left(-785 + 6570i - 23340i^2 + 44720i^3 - 47385i^4 + 23166i^5\right)}{180180}$$

m=0, n=0, p=1,
$$\frac{d^6(-163 + i(1425 + i(-5300 + 13i(820 + i(-915 + 473i)))))}{180180}$$

m=0, n=1, p=0,
$$\frac{d^6\left(216 - 1765i + 6080i^2 - 11180i^3 + 11180i^4 - 5005i^5\right)}{180180}$$

m=0, n=1, p=1,
$$-\frac{d^6\left(-44 + 375i - 1350i^2 + 2600i^3 - 2730i^4 + 1287i^5\right)}{180180}$$

m=1, n=0, p=0,
$$\frac{d^6\left(216 - 1765i + 6080i^2 - 11180i^3 + 11180i^4 - 5005i^5\right)}{180180}$$

m=1, n=0, p=1,
$$-\frac{d^6\left(-44 + 375i - 1350i^2 + 2600i^3 - 2730i^4 + 1287i^5\right)}{180180}$$

m=1, n=1, p=0,
$$\frac{d^6(-30 + i(240 + i(-805 + 13i(110 + i(-105 + 44i)))))}{90090}$$

m=1, n=1, p=1,

$$\frac{d^6(-6 + i(50 + i(-175 + 13i(25 + i(-25 + 11i)))))}{90090}$$

S-19 $\langle S_m^{(i)} | S_p^{(i+1)} | S_n^{(i)} \rangle , (i \neq 0)$

S-19.1 Description

The integrals appearing in Eq. (26) in the paper, where $S_m^{(i)}$ and $S_n^{(i)}$ are located in a mesh point $i(i \neq 0)$, and $S_p^{(i+1)}$ is located in a mesh point $(i+1)$.

S-19.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    For[p=0, p<=1, ++p,
      Print["m=",m,"    ","n=",n,"    ","p=",p,"    ",
        Simplify[
          Integrate[S[m,(x-i*d)/d]*S[n,(x-i*d)/d]
                    *(-1)^p*S[p,-(x-(i+1)*d)/d]*2*x^5,
                    {x,i*d,(i+1)*d}]
        ]
      ]
    ]
  ]
]
```

S-19.3 Analytic formulas

m=0, n=0, p=0,
$$\frac{d^6 \left(785 + 6570i + 23340i^2 + 44720i^3 + 47385i^4 + 23166i^5\right)}{180180}$$

m=0, n=0, p=1,
$$-\frac{d^6(163 + i(1425 + i(5300 + 13i(820 + i(915 + 473i)))))}{180180}$$

m=0, n=1, p=0,
$$\frac{d^6 \left(216 + 1765i + 6080i^2 + 11180i^3 + 11180i^4 + 5005i^5\right)}{180180}$$

m=0, n=1, p=1,
$$-\frac{d^6 \left(44 + 375i + 1350i^2 + 2600i^3 + 2730i^4 + 1287i^5\right)}{180180}$$

m=1, n=0, p=0,
$$\frac{d^6 \left(216 + 1765i + 6080i^2 + 11180i^3 + 11180i^4 + 5005i^5\right)}{180180}$$

m=1, n=0, p=1,
$$-\frac{d^6 \left(44 + 375i + 1350i^2 + 2600i^3 + 2730i^4 + 1287i^5\right)}{180180}$$

m=1, n=1, p=0,
$$\frac{d^6(30 + i(240 + i(805 + 13i(110 + i(105 + 44i)))))}{90090}$$

m=1, n=1, p=1,

$$-\frac{d^6(6 + i(50 + i(175 + 13i(25 + i(25 + 11i)))))}{90090}$$

S-20 $\quad \langle S_m^{(i)} | S_p^{(i)} | S_n^{(i+1)} \rangle$

S-20.1 Description

The integrals appearing in Eq. (26) in the paper, where $S_m^{(i)}$ and $S_p^{(i)}$ are located in a mesh point i, and $S_n^{(i+1)}$ is located in a mesh point $(i+1)$.

S-20.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    For[p=0, p<=1, ++p,
      Print["m=",m,"    ","n=",n,"    ","p=",p,"    ",
        Simplify[
          Integrate[S[m,(x-i*d)/d]*(-1)^n*S[n,-(x-(i+1)*d)/d]
                    *S[p,(x-i*d)/d]*2*x^5,{x,i*d,(i+1)*d}]
        ]
      ]
    ]
  ]
]
```

S-20.3 Analytic formulas

m=0, n=0, p=0,
$$\frac{d^6 \left(785 + 6570i + 23340i^2 + 44720i^3 + 47385i^4 + 23166i^5\right)}{180180}$$

m=0, n=0, p=1,
$$\frac{d^6 \left(216 + 1765i + 6080i^2 + 11180i^3 + 11180i^4 + 5005i^5\right)}{180180}$$

m=0, n=1, p=0,
$$-\frac{d^6(163 + i(1425 + i(5300 + 13i(820 + i(915 + 473i)))))}{180180}$$

m=0, n=1, p=1,
$$-\frac{d^6 \left(44 + 375i + 1350i^2 + 2600i^3 + 2730i^4 + 1287i^5\right)}{180180}$$

m=1, n=0, p=0,
$$\frac{d^6 \left(216 + 1765i + 6080i^2 + 11180i^3 + 11180i^4 + 5005i^5\right)}{180180}$$

m=1, n=0, p=1,
$$\frac{d^6(30 + i(240 + i(805 + 13i(110 + i(105 + 44i)))))}{90090}$$

m=1, n=1, p=0,
$$-\frac{d^6 \left(44 + 375i + 1350i^2 + 2600i^3 + 2730i^4 + 1287i^5\right)}{180180}$$

m=1, n=1, p=1,

$$-\frac{d^6(6+i(50+i(175+13i(25+i(25+11i)))))}{90090}$$

S-21 $\langle S_m^{(i)}|S_p^{(i+1)}|S_n^{(i+1)}\rangle$

S-21.1 Description

The integrals appearing in Eq. (26) in the paper, where $S_m^{(i)}$ is located in a mesh point i, and $S_p^{(i)}$ and $S_n^{(i+1)}$ are located in a mesh point $(i+1)$.

S-21.2 MATHEMATICA code

```
S[n_,x_]:= Module[{}, Which[ n==0, 1-3*x^2+2*x^3, n==1,  x-2*x^2+x^3]];

For[m=0, m<=1, ++m,
  For[n=0, n<=1, ++n,
    For[p=0, p<=1, ++p,
      Print["m=",m,"    ","n=",n,"    ","p=",p,"    ",
        Simplify[
          Integrate[S[m,(x-i*d)/d]*(-1)^n*S[n,-(x-(i+1)*d)/d]
                    *(-1)^p*S[p,-(x-(i+1)*d)/d]*2*x^5,
                    {x,i*d,(i+1)*d}]
        ]
      ]
    ]
  ]
]
```

S-21.3 Analytic formulas

m=0, n=0, p=0,
$$\frac{d^6\left(2946 + 20340i + 58170i^2 + 86840i^3 + 68445i^4 + 23166i^5\right)}{180180}$$

m=0, n=0, p=1,
$$-\frac{d^6\left(474 + 3450i + 10430i^2 + 16510i^3 + 13845i^4 + 5005i^5\right)}{180180}$$

m=0, n=1, p=0,
$$-\frac{d^6\left(474 + 3450i + 10430i^2 + 16510i^3 + 13845i^4 + 5005i^5\right)}{180180}$$

m=0, n=1, p=1,
$$\frac{d^6(42 + i(320 + i(1015 + 13i(130 + i(115 + 44i)))))}{90090}$$

m=1, n=0, p=0,
$$\frac{d^6(876 + i(5970 + i(16800 + 13i(1890 + i(1450 + 473i)))))}{180180}$$

m=1, n=0, p=1,
$$-\frac{d^6\left(138 + 990i + 2940i^2 + 4550i^3 + 3705i^4 + 1287i^5\right)}{180180}$$

m=1, n=1, p=0,
$$-\frac{d^6\left(138 + 990i + 2940i^2 + 4550i^3 + 3705i^4 + 1287i^5\right)}{180180}$$

m=1, n=1, p=1,

$$\frac{d^6(12 + i(90 + i(280 + 13i(35 + i(30 + 11i)))))}{90090}$$

S-22 Integrals used in the HF calculation

S-22.1 Description

In this section, the detailed formula of D, Q, L, and R integrals are derived, which appears in Eqs. (56), (59), (60), and (61), respectively, in the article. D integral (56) is defined as

$$D^l_{i,k,i',k'} \equiv \int_{\sup(i'-1,0)}^{i+1} dt \; t^l S_k(t-i) S_{k'}(t-i'), \tag{S-1}$$

where $i \leq i'$ is assumed. This integral has non-zero value only when i and i' are at the same mesh point or at the neighboring mesh points with each other. Furthermore, as mentioned in the article text, since the lower limit of the integration range is bounded to be non-negative, the case with $i = i' = 0$ requires special treatment. Consequently, the following three cases should be considered:

Case 1. $i = i' = 0$:

$$D^l_{0,k,0,k'} = D^{(1),l}_{k,k'} \equiv \int_0^1 dt \; t^l S_k(t) S_{k'}(t). \tag{S-2}$$

Case 2. $i = i' > 0$:

$$D^l_{i,k,i,k'} = D^{(2),l}_{i,k,k'} \equiv \int_{-1}^1 dt \; (t+i)^l S_k(t) S_{k'}(t). \tag{S-3}$$

Case 3. $i = i' - 1 \geq 0$:

$$D^l_{i,k,i+1,k'} = D^{(3),l}_{i,k,k'} \equiv \int_0^1 dt \; (t+i)^l S_k(t) S_{k'}(t-1). \tag{S-4}$$

Q integral (59) is defined as

$$Q^\lambda_{\{i_t\}\{k_t\}} \equiv \int_{\sup(i_4-1,0)}^{i_1+1} dt \int_{\sup(i_4-1,0)}^{i_1+1} dt' \; t_<^{5+2\lambda} t_>^{3-2\lambda}$$
$$\times S_{k_1}(t-i_1) S_{k_2}(t'-i_2) S_{k_3}(t-i_3) S_{k_4}(t'-i_4), \tag{S-5}$$

When the ordering between the indices i_1, i_2, i_3, and i_4 is assumed as in Eqs. (51) and (52) in the article, the combinations of the indices which gives non-zero value of Q integral are classified into 6 different cases as follows:

Case 1 $i_1 = i_2 = i_3 = i_4 = i = 0$:

$$Q^{(1),\lambda}_{k_1,k_2,k_3,k_4} \equiv \int_0^1 dt \; t^{3-2\lambda} S_{k_1}(t) S_{k_3}(t) \int_0^t du \; u^{5+2\lambda} S_{k_2}(u) S_{k_4}(u)$$
$$+ \int_0^1 dt \; t^{5+2\lambda} S_{k_1}(t) S_{k_3}(t) \int_t^1 du \; u^{3-2\lambda} S_{k_2}(u) S_{k_4}(u). \tag{S-6}$$

Case 2: $i_1 = i_2 = i_3 = i_4 = i > 0$: lx,

$$Q^{(2),\lambda}_{i,k_1,k_2,k_3,k_4} \equiv \int_{-1}^1 dt \; (t+i)^{3-2\lambda} S_{k_1}(t) S_{k_3}(t) \int_{-1}^t du \; (u+i)^{5+2\lambda} S_{k_2}(u) S_{k_4}(u)$$
$$+ \int_{-1}^1 dt \; (t+i)^{5+2\lambda} S_{k_1}(t) S_{k_3}(t) \int_t^1 dt' \; (u+i)^{3-2\lambda} S_{k_2}(u) S_{k_4}(u). \tag{S-7}$$

Case 3: $i_1 = i_2 = i$, and $i_3 = i_4 = i + 1$:

$$Q_{i,k_1,k_2,k_3,k_4}^{(3),\lambda} \equiv \int_0^1 dt\; t^{3-2\lambda} S_{k_1}(t) S_{k_3}(t-1) \int_0^t du\; u^{5+2\lambda} S_{k_2}(u) S_{k_4}(u-1)$$

$$+ \int_0^1 dt\; t^{5+2\lambda} S_{k_1}(t) S_{k_3}(t-1) \int_t^1 du\; u^{3-2\lambda} S_{k_2}(u) S_{k_4}(u-1). \quad \text{(S-8)}$$

Case 4: $i_1 = i_2 = i_3 = i$, and $i_4 = i + 1$:

$$Q_{i,k_1,k_2,k_3,k_4}^{(4),\lambda} \equiv \int_0^1 dt\; (t+i)^{3-2\lambda} S_{k_1}(t) S_{k_3}(t) \int_0^t du\; (u+i)^{5+2\lambda} S_{k_2}(u) S_{k_4}(u-1)$$

$$t \int_0^1 dt\; (t+i)^{5+2\lambda} S_{k_1}(t) S_{k_3}(t) \int_t^1 du\; (u+i)^{3-2\lambda} S_{k_2}(u) S_{k_4}(u-1).$$

$$\text{(S-9)}$$

Case 5: $i_1 = i$, and $i_2 = i_3 = i_4 = i + 1$:

$$Q_{i,k_1,k_2,k_3,k_4}^{(5),\lambda} \equiv \int_0^1 dt\; (t+i)^{3-2\lambda} S_{k_1}(t) S_{k_3}(t-1) \int_0^t du\; (u+i)^{5+2\lambda} S_{k_2}(u-1) S_{k_4}(u-1)$$

$$+ \int_0^1 dt\; (t+i)^{5+2\lambda} S_{k_1}(t) S_{k_3}(t-1) \int_t^1 du\; (u+i)^{3-2\lambda} S_{k_4}(u-1) S_{k_2}(u-1).$$

$$\text{(S-10)}$$

Case 6: $i_1 = i_3 = i$, and $i_2 = i_4 = i + 1$:

$$Q_{i,k_1,k_2,k_3,k_4}^{(6),\lambda} \equiv \int_0^1 dt\; (t+i)^{3-2\lambda} S_{k_1}(t) S_{k_3}(t) \int_0^t du\; (u+i)^{5+2\lambda} S_{k_2}(u-1) S_{k_4}(u-1)$$

$$+ \int_0^1 dt\; (t+i)^{5+2\lambda} S_{k_1}(t) S_{k_3}(t) \int_t^1 du\; (u+i)^{3-2\lambda} S_{k_2}(u-1) S_{k_4}(u-1).$$

$$\text{(S-11)}$$

L and R integrals are defined as

$$L_{i_1,k_1,i_3,k_3}^{\lambda,i_4} \equiv \int_{\sup(i_3-1,0)}^{i_4-1} dt\; t^{\lambda} S_{k_1}(t-i_1) S_{k_3}(t-i_3), \quad \text{(S-12)}$$

and

$$R_{i_2,k_2,i_4,k_4}^{\lambda,i_1} \equiv \int_{i_1+1}^{i_4+1} dt\; t^{\lambda} S_{k_2}(t-i_2) S_{k_4}(t-i_4). \quad \text{(S-13)}$$

It turns out that L is non-zero only when $i_1 = i_3 = i > 0$ and $i_4 = i + 1$, and that R is non-zero only when $i_1 = i$ and $i_2 = i_4 = i + 1$. Therefore, the actual forms that one has to solve are

$$L_{i,k_1,k_3}^{\lambda} \equiv \int_{-1}^{0} dt\; (t+i)^{\lambda} S_{k_1}(t) S_{k_3}(t), \quad \text{(S-14)}$$

and

$$R_{i,k_2,k_4}^{\lambda} \equiv \int_0^1 dt\; (t+i+1)^{\lambda} S_{k_2}(t) S_{k_4}(t). \quad \text{(S-15)}$$

These integrals can be easily solved, especially when one can use an algebraic computing software such as MATHEMATICA. In the following section, we provide MATHEMATICA code to sovle each one of the above integrals. It is worth noting here that we have observed a

serious numerical error in the numerical evaluation of the integrated formula for some of the integrals. It is caused by logarithmic terms such as $\log(1 \pm 1/i)$ produced by the integration of the $t^{3-2\lambda}$ term when $2 \leq \lambda \leq 5$. Because the logarithmic terms and the polynomial terms have almost the same value with opposite sign, a large number of significant digits were lost. To avoid this problem, we extracted the first n terms of the logarithmic terms as follows:

$$\log(1 \pm \frac{1}{x}) = - \sum_{j=1}^{n} (\mp)^j \frac{1}{jx^j} + \text{Log}_n(x), \tag{S-16}$$

where $LOG_n(x)$ holds the remaining high order terms

$$\text{Log}_n(x) = - \sum_{j=n+1}^{\infty} (\mp)^j \frac{1}{jx^j}. \tag{S-17}$$

By taking $n = 20$, we have confirmed that the low order terms in Eq. (S-16) exactly cancel out the leading polynomial terms and thus the accurate evaluation were achieved. For large x ($x \geq 10$), $\text{Log}_n(x)$ is efficiently evaluated by taking first 20 terms in Eq. (S-17). For smaller x ($x < 10$), since x is an integer here, the simplest way is looking up in a table of values which are precalculated via a high precision arithmetic programs such as, again, Mathematica.

S-22.2 Mathematica code

```
(* HERMITE SPLINE BASIS FUNCTION *)
S[t_, k_] := Assuming[{t \[Element] Reals, k \[Element] Integers,
  0<=k<=1},
  If[k==0,
    (* even *) If[0<=t<=1, 1-3t^2+2t^3, If[-1<=t<=0, 1-3t^2-2t^3, 0]],
    (* odd  *) If[0<=t<=1, t-2t^2+t^3, If[-1<=t<=0, t+2t^2+t^3, 0]]]]


(***** D INTERGALS *****)

(* CASE 1: EQ. (S-2) *)
D1[l_,k1_,k2_]:=
  Assuming[ {l\[Element]Integers},
    Integrate[t^l*S[t,k1]*S[t,k2], {t,0,1}] ]

(* CASE 2: EQ. (S-3) *)
D2[l_,i_,k1_,k2_]:=
  Assuming[ {i\[Element]Integers, i>0, l\[Element]Integers},
    Integrate[(t+i)^l*S[t,k1]*S[t,k2], {t,-1,0}]
    + Integrate[(t+i)^l*S[t,k1]*S[t,k2], {t,0,1}] ]

(* CASE 3: EQ. (S-4) *)
D3[l_,i_,k1_,k2_]:=
  Assuming[ {i\[Element]Integers, i>=0, l\[Element]Integers},
    Integrate[(t+i)^l*S[t,k1]*S[t-1,k2], {t,0,1}] ]

(***** Q INTEGRALS *****)

(* CASE 1: EQ. (S-6) *)
Q1[l_,k1_,k2_,k3_,k4_]:=
  Assuming[ {l\[Element]Integers, l>=0},
    Integrate[t^(3-2l)*S[t,k1]*S[t,k3]
      *Assuming[ {0<=t<=1},
```

```
          Integrate[u^(2l+5)*S[u,k2]*S[u,k4], {u,0,t}] ]
        ,{t,0,1}]
    + Integrate[t^(3-2l)*S[t,k2]*S[t,k4]
        *Assuming[ {0<=t<=1},
          Integrate[u^(2l+5)*S[u,k1]*S[u,k3], {u,0,t}] ]
        ,{t,0,1}] ]

(* CASE 2: EQ. (S-7) *)
Q2[l_,i_,k1_,k2_,k3_,k4_]:=
  Assuming[ {i\[Element] Integers, i>0, l\[Element]Integers, l>=0},
    Integrate[(t+i)^(3-2l)*S[t,k1]*S[t,k3]
        *Assuming[ {-1<=t<=0},
          Integrate[(u+i)^(2l+5)*S[u,k2]*S[u,k4], {u,-1,t}] ]
        ,{t,-1,0}]
    + Integrate[(t+i)^(3-2l)*S[t,k1]*S[t,k3]
        *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u,k2]*S[u,k4], {u,-1,0}] ]
        ,{t,0,1}]
    + Integrate[(t+i)^(3-2l)*S[t,k1]*S[t,k3]
        *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u,k2]*S[u,k4], {u,0,t}] ]
        ,{t,0,1}]
    + Integrate[(t+i)^(3-2l)*S[t,k2]*S[t,k4]
        *Assuming[ {-1<=t<=0},
          Integrate[(u+i)^(2l+5)*S[u,k1]*S[u,k3], {u,-1,t}] ]
        ,{t,-1,0}]
    + Integrate[(t+i)^(3-2l)*S[t,k2]*S[t,k4]
        *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u,k1]*S[u,k3], {u,-1,0}] ]
        ,{t,0,1}]
    + Integrate[(t+i)^(3-2l)*S[t,k2]*S[t,k4]
        *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u,k1]*S[u,k3], {u,0,t}] ]
        ,{t,0,1}] ]

(* CASE 3: EQ. (S-8) *)
Q3[l_,i_,k1_,k2_,k3_,k4_]:=
  Assuming[ {i\[element]Integers, i>=0, l\[Element]Integers, l>=0},
    Integrate[(t+i)^(3-2l)*S[t,k1]*S[t-1,k3]
        *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u,k2]*S[u-1,k4], {u,0,t}] ]
        ,{t,0,1}]
    + Integrate[(t+i)^(3-2l)*S[t,k2]*S[t-1,k4]
        *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u,k1]*S[u-1,k3], {u,0,t}] ]
        ,{t,0,1}] ]

(* CASE 4: EQ. (S-9) *)
Q4[l_,i_,k1_,k2_,k3_,k4_]:=
  Assuming[ {i\[Element]Integers, i>=0, l\[Element]Integers, l>=0},
    Integrate[(t+i)^(3-2l)*S[t,k1]*S[t,k3]
        *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u,k2]*S[u-1,k4], {u,0,t}] ]
        ,{t,0,1}]
```

```
          + Integrate[(t+i)^(3-2l)*S[t,k2]*S[t-1,k4]
             *Assuming[ {0<=t<=1},
                Integrate[(u+i)^(2l+5)*S[u,k1]*S[u,k3], {u,0,t}] ]
             ,{t,0,1}] ]

(* CASE 5: EQ. (S-10) *)
Q5[l_,i_,k1_,k2_,k3_,k4_]:=
  Assuming[{i\[Element]Integers, i>=0, l\[Element]Integers, l>=0},
    Integrate[(t+i)^(3-2l)*S[t,k1]*S[t-1,k3]
       *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u-1,k2]*S[u-1,k4], {u,0,t}] ]
       ,{t,0,1}]
      + Integrate[(t+i)^(3-2l)*S[t-1,k2]*S[t-1,k4]
           *Assuming[ {0<=t<=1},
              Integrate[(u+k)^(2l+5)*S[u,k1]*S[u-1,k3], {u,0,t}] ]
           ,{t,0,1}] ]

(* CASE 6: EQ. (S-11) *)
Q6[l_,i_,k1_,k2_,k3_,k4_]:=
  Assuming[ {i\[Element]Integers, i>=0, l\[Element]Integers, l>=0},
    Integrate[(t+i)^(3-2l)*S[t,k1]*S[t,k3]
       *Assuming[ {0<=t<=1},
          Integrate[(u+i)^(2l+5)*S[u-1,k2]*S[u-1,k4], {u,0,t}] ]
       ,{t,0,1}]
      + Integrate[(t+i)^(3-2l)*S[t-1,k2]*S[t-1,k4]
           *Assuming[ {0<=t<=1},
              Integrate[(u+i)^(2l+5)*S[u,k1]*S[u,k3], {u,0,t}] ]
           ,{t,0,1}] ]

(***** L INTEGRAL *****)

(* EQ. (S-14) *)
L[l_,i_,k1_,k2_]:=
  Assuming[ {i\[Element]Integers, i>0, l\[Element]Integers, l>=0},
    Integrate[(t+i)^(2l+5)*S[t,k3]*S[t,k4], {t,-1,0}] ]

(***** R INTEGRAL *****)

(* EQ. (S-15) *)
R[l_,i_,k2_,k4_]:=
  Assuming[ {i\[Element]Integers, i>=0, l\[Element]Integers, l>=0},
    Integrate[(t+i+1)^(3-2l)*S[t,k2]*S[t,k4], {t, 0, 1}] ]
```

S-22.3   Analytic formulas of the integrals D

Case 1: $i_1 = i_2 = 0$

$$\text{D1}\,[l, k = 0, k' = 0]$$

$$= \frac{72(13 + 3l)}{(1 + l)(3 + l)(4 + l)(5 + l)(6 + l)(7 + l)}$$

$$\text{D1}\,[l, k = 0, k' = 1]$$

$$= \frac{24(11 + 3l)}{(2 + l)(3 + l)(4 + l)(5 + l)(6 + l)(7 + l)}$$

D1 $[l, k = 1, k' = 1]$

$$= \frac{24(11 + 3l)}{(2 + l)(3 + l)(4 + l)(5 + l)(6 + l)(7 + l)}$$

Case 2: $i_1 = i_2 = i > 0$

D2 $[l = 5, i, k = 0, k' = 0]$

$$= \frac{5i}{77} + \frac{38i^3}{63} + \frac{26i^5}{35}$$

D2 $[l = 7, i, k = 0, k' = 0]$

$$= \frac{62i}{2145} + \frac{5i^3}{11} + \frac{19i^5}{15} + \frac{26i^7}{35}$$

D2 $[l = 9, i, k = 0, k' = 0]$

$$= \frac{74i}{5005} + \frac{248i^3}{715} + \frac{18i^5}{11} + \frac{76i^7}{35} + \frac{26i^9}{35}$$

D2 $[l = 11, i, k = 0, k' = 0]$

$$= \frac{129i}{15470} + \frac{74i^3}{273} + \frac{124i^5}{65} + \frac{30i^7}{7} + \frac{209i^9}{63} + \frac{26i^{11}}{35}$$

D2 $[l = 13, i, k = 0, k' = 0]$

$$= \frac{49i}{9690} + \frac{129i^3}{595} + \frac{74i^5}{35} + \frac{248i^7}{35} + \frac{65i^9}{7} + \frac{494i^{11}}{105} + \frac{26i^{13}}{35}$$

D2 $[l = 15, i, k = 0, k' = 0]$

$$= \frac{22i}{6783} + \frac{343i^3}{1938} + \frac{387i^5}{170} + \frac{74i^7}{7} + \frac{62i^9}{3} + \frac{195i^{11}}{11} + \frac{19i^{13}}{3} + \frac{26i^{15}}{35}$$

D2 $[l = 17, i, k = 0, k' = 0]$

$$= \frac{366i}{168245} + \frac{176i^3}{1197} + \frac{686i^5}{285} + \frac{516i^7}{35} +$$
$$\frac{2516i^9}{63} + \frac{8432i^{11}}{165} + \frac{340i^{13}}{11} + \frac{2584i^{15}}{315} + \frac{26i^{17}}{35}$$

D2 $[l = 19, i, k = 0, k' = 0]$

$$= \frac{67i}{44275} + \frac{1098i^3}{8855} + \frac{88i^5}{35} + \frac{98i^7}{5} +$$
$$\frac{2451i^9}{35} + \frac{47804i^{11}}{385} + \frac{80104i^{13}}{715} + \frac{3876i^{15}}{77} + \frac{361i^{17}}{35} + \frac{26i^{19}}{35}$$

D2 $[l = 5, i, k = 0, k' = 1]$

$$= \frac{13}{6930} + \frac{4i^2}{63} + \frac{i^4}{6}$$

D2 $[l = 7, i, k = 0, k' = 1]$

$$= \frac{32}{45045} + \frac{13i^2}{330} + \frac{2i^4}{9} + \frac{7i^6}{30}$$

D2 $[l = 9, i, k = 0, k' = 1]$

$$= \frac{19}{60060} + \frac{128i^2}{5005} + \frac{13i^4}{55} + \frac{8i^6}{15} + \frac{3i^8}{10}$$

D2 $[l = 11, i, k = 0, k' = 1]$

$$= \frac{11}{69615} + \frac{19i^2}{1092} + \frac{64i^4}{273} + \frac{13i^6}{15} + \frac{22i^8}{21} + \frac{11i^{10}}{30}$$

D2 $[l = 13, i, k = 0, k' = 1]$

$$= \frac{1}{11628} + \frac{22i^2}{1785} + \frac{19i^4}{84} + \frac{128i^6}{105} + \frac{169i^8}{70} + \frac{572i^{10}}{315} + \frac{13i^{12}}{30}$$

D2 $[l = 15, i, k = 0, k' = 1]$

$$= \frac{8}{159885} + \frac{35i^2}{3876} + \frac{11i^4}{51} + \frac{19i^6}{12} + \frac{32i^8}{7} + \frac{169i^{10}}{30} + \frac{26i^{12}}{9} + \frac{i^{14}}{2}$$

D2 $[l = 17, i, k = 0, k' = 1]$

$$=$$

$$\frac{31}{1009470} + \frac{64i^2}{9405} + \frac{35i^4}{171} + \frac{88i^6}{45} + \frac{323i^8}{42} + \frac{4352i^{10}}{315} + \frac{5746i^{12}}{495} + \frac{272i^{14}}{63} + \frac{17i^{16}}{30}$$

D2 $[l = 19, i, k = 0, k' = 1]$

$$= \frac{34}{1726725} + \frac{93i^2}{17710} + \frac{32i^4}{165} + \frac{7i^6}{3} +$$
$$\frac{418i^8}{35} + \frac{6137i^{10}}{210} + \frac{41344i^{12}}{1155} + \frac{8398i^{14}}{385} + \frac{646i^{16}}{105} + \frac{19i^{18}}{30}$$

D2 $[l = 5, i, k = 1, k' = 1]$

$$= \frac{15i + 110i^3 + 66i^5}{3465}$$

D2 $[l = 7, i, k = 1, k' = 1]$

$$= \frac{98i + 1365i^3 + 3003i^5 + 858i^7}{45045}$$

D2 $[l = 9, i, k = 1, k' = 1]$

$$= \frac{18i + 392i^3 + 1638i^5 + 1716i^7 + 286i^9}{15015}$$

D2 $[l = 11, i, k = 1, k' = 1]$

$$= \frac{11i}{15470} + \frac{2i^3}{91} + \frac{28i^5}{195} + \frac{2i^7}{7} + \frac{11i^9}{63} + \frac{2i^{11}}{105}$$

D2 $[l = 13, i, k = 1, k' = 1]$

$$= \frac{13i}{29070} + \frac{11i^3}{595} + \frac{6i^5}{35} + \frac{8i^7}{15} + \frac{13i^9}{21} + \frac{26i^{11}}{105} + \frac{2i^{13}}{105}$$

D2 $[l = 15, i, k = 1, k' = 1]$

$$= \frac{2i}{6783} + \frac{91i^3}{5814} + \frac{33i^5}{170} + \frac{6i^7}{7} + \frac{14i^9}{9} + \frac{13i^{11}}{11} + \frac{i^{13}}{3} + \frac{2i^{15}}{105}$$

D2 $[l = 17, i, k = 1, k' = 1]$

$$= \frac{34i}{168245} + \frac{16i^3}{1197} + \frac{182i^5}{855} + \frac{44i^7}{35} + \frac{68i^9}{21} + \frac{1904i^{11}}{495} + \frac{68i^{13}}{33} + \frac{136i^{15}}{315} + \frac{2i^{17}}{105}$$

D2 $[l = 19, i, k = 1, k' = 1]$

$$= \frac{19i}{132825} + \frac{102i^3}{8855} + \frac{8i^5}{35} + \frac{26i^7}{15} +$$
$$\frac{209i^9}{35} + \frac{3876i^{11}}{385} + \frac{18088i^{13}}{2145} + \frac{1292i^{15}}{385} + \frac{19i^{17}}{35} + \frac{2i^{19}}{105}$$

D2 $[l = 3, i, k = 0, k' = 0]$

$$= \frac{1}{105} \left(19i + 78i^3 \right)$$

D2 $[l = 1, i, k = 0, k' = 0]$

$$= \frac{26i}{35}$$

D2 $[l = -1, i, k = 0, k' = 0]$

$$=$$

$$\frac{1}{29099070i^{19}} \left(3063060 - 3315312i^2 - 11079068i^4 + 11319i^6 + 22059i^8 + 47804i^{10} + 120156i^{12} + 377910i^{14} + 1755182i^{16} + 21616452i^{18} \right) +$$
$$\left(-1 + 6i^2 - 4i^3 - 9i^4 + 12i^5 - 4i^6 \right) \text{Log20}[-i] +$$
$$\left(1 - 6i^2 - 4i^3 + 9i^4 + 12i^5 + 4i^6 \right) \text{Log20}[i]$$

D2 $[l = -3, i, k = 0, k' = 0]$

$= \dfrac{1}{9699690 i^{19}} \left(5513508 - 55175120 i^2 + 343343 i^4 + 485298 i^6 + \right.$
$\left. 717060 i^8 + 1121456 i^{10} + 1889550 i^{12} + 3510364 i^{14} + 7205484 i^{16}\right) +$
$\left(6 - 12i - 54 i^2 + 120 i^3 - 60 i^4\right) \text{Log20}[-i] +$
$\left(-6 - 12i + 54 i^2 + 120 i^3 + 60 i^4\right) \text{Log20}[i]$

D2 $[l = -5, i, k = 0, k' = 0]$

$= \dfrac{1}{9699690 i^{19}} \left(-49008960 + 6866860 i^2 + 7360353 i^4 + \right.$
$\left. 7887660 i^6 + 8410920 i^8 + 8817900 i^{10} + 8775910 i^{12} + 7205484 i^{14}\right) +$
$\left(-9 + 60i - 60 i^2\right) \text{Log20}[-i] + \left(9 + 60i + 60 i^2\right) \text{Log20}[i]$

D2 $[l = -7, i, k = 0, k' = 0]$
$= \left(6126120 - 5405400 i^2 + 192192 i^4 + 280896 i^6 + \right.$
$\left. 434112 i^8 + 723520 i^{10} + 1343680 i^{12} + 2956096 i^{14} + 10808226 i^{16}\right) /$
$\left(14549535 i^{19} \left(-1 + i^2\right)^2\right) - 4\text{Log20}[-i] + 4\text{Log20}[i]$

D2 $[l = -9, i, k = 0, k' = 0]$
$= \dfrac{1 - 9 i^2 + 26 i^4}{35 i^5 \left(-1 + i^2\right)^4}$

D2 $[l = -11, i, k = 0, k' = 0]$
$= \dfrac{1 - 8 i^2 + 27 i^4 - 50 i^6 + 78 i^8}{105 i^7 \left(-1 + i^2\right)^6}$

D2 $[l = 3, i, k = 0, k' = 1]$
$= \dfrac{1}{630} \left(4 + 63 i^2\right)$

D2 $[l = 1, i, k = 0, k' = 1]$
$= \dfrac{1}{30}$

D2 $[l = -1, i, k = 0, k' = 1]$
$= \dfrac{1}{58198140 i^{18}} \left(5513508 - 28220192 i^2 - 5005 i^4 - 9196 i^6 - \right.$
$\left. 18411 i^8 - 41344 i^{10} - 109174 i^{12} - 369512 i^{14} - 1939938 i^{16}\right) +$
$\left(i - 2 i^2 - 2 i^3 + 8 i^4 - 7 i^5 + 2 i^6\right) \text{Log20}[-i] +$
$\left(-i - 2 i^2 + 2 i^3 + 8 i^4 + 7 i^5 + 2 i^6\right) \text{Log20}[i]$

D2 $[l = -3, i, k = 0, k' = 1]$

$= \frac{1}{58198140i^{20}} \left(11639628 - 229661432i^2 - 525525i^4 - 717288i^6 - 1012605i^8 - 1488384i^{10} - 2292654i^{12} - 3695120i^{14} - 5819814i^{16} \right) + \left(-2 - 6i + 48i^2 - 70i^3 + 30i^4 \right) \text{Log20}[-i] + \left(-2 + 6i + 48i^2 + 70i^3 + 30i^4 \right) \text{Log20}[i]$

D2 $[l = -5, i, k = 0, k' = 1]$

$=$

$\frac{1}{58198140i^{20}} \left(-46558512 - 11911900i^2 - 12552540i^4 - 13163865i^6 - 13643520i^8 - 13755924i^{10} - 12932920i^{12} - 9699690i^{14} \right) + \left(8 - 35i + 30i^2 \right) \text{Log20}[-i] + \left(8 + 35i + 30i^2 \right) \text{Log20}[i]$

D2 $[l = -7, i, k = 0, k' = 1]$

$= \frac{-252 + 224i^2 - 7i^4 - 10i^6 - 15i^8 - 24i^{10} - 42i^{12} - 84i^{14} - 294i^{16}}{1260i^{20} \left(-1 + i^2 \right)^2} +$

$2\text{Log20}[-i] + 2\text{Log20}[i]$

D2 $[l = -9, i, k = 0, k' = 1]$

$= \frac{-5 + 32i^2 - 63i^4}{210i^6 \left(-1 + i^2 \right)^4}$

D2 $[l = -11, i, k = 0, k' = 1]$

$= \frac{-7 + 50i^2 - 150i^4 + 242i^6 - 231i^8}{630i^8 \left(-1 + i^2 \right)^6}$

D2 $[l = 3, i, k = 1, k' = 1]$

$= \frac{1}{105} \left(i + 2i^3 \right)$

D2 $[l = 1, i, k = 1, k' = 1]$

$= \frac{2i}{105}$

D2 $[l = -1, i, k = 1, k' = 1]$

$= \frac{1}{29099070i^{17}} \left(-8576568 - 2770768i^2 + 1001i^4 + 1881i^6 + 3876i^8 + 9044i^{10} + 25194i^{12} + 92378i^{14} + 554268i^{16} \right) + \left(-i^2 + 4i^3 - 6i^4 + 4i^5 - i^6 \right) \text{Log20}[-i] + \left(i^2 + 4i^3 + 6i^4 + 4i^5 + i^6 \right) \text{Log20}[i]$

D2 $[l = -3, i, k = 1, k' = 1]$

$= \dfrac{1}{29099070i^{19}} \left(-31855824 - 41501460i^2 + 91091i^4 + 124146i^6 + \right.$
$\left. 174420i^8 + 253232i^{10} + 377910i^{12} + 554268i^{14} + 554268i^{16}\right) +$
$\left(-1 + 12i - 36i^2 + 40i^3 - 15i^4\right) \text{Log20}[-i] +$
$\left(1 + 12i + 36i^2 + 40i^3 + 15i^4\right) \text{Log20}[i]$

D2 $[l = -5, i, k = 1, k' = 1]$

$= \dfrac{1}{29099070i^{19}} \left(-39819780 + 1821820i^2 + 1882881i^4 + \right.$
$\left. 1918620i^6 + 1899240i^8 + 1763580i^{10} + 1385670i^{12} + 554268i^{14}\right) +$
$\left(-6 + 20i - 15i^2\right) \text{Log20}[-i] + \left(6 + 20i + 15i^2\right) \text{Log20}[i]$

D2 $[l = -7, i, k = 1, k' = 1]$
$= \left(1531530 - 1351350i^2 + 48048i^4 + 70224i^6 + 108528i^8 + 180880i^{10} + 335920i^{12} + \right.$
$\left. 739024i^{14} + 277134i^{16}\right) / \left(14549535i^{19} \left(-1 + i^2\right)^2\right) - \text{Log20}[-i] + \text{Log20}[i]$

D2 $[l = -9, i, k = 1, k' = 1]$

$= \dfrac{-3 + 7i^2 + 2i^4}{105i^5 \left(-1 + i^2\right)^4}$

D2 $[l = -11, i, k = 1, k' = 1]$

$= \dfrac{-3 + 16i^2 - 33i^4 + 30i^6 + 6i^8}{315i^7 \left(-1 + i^2\right)^6}$

Case 3: $i_1 = i, \ i_2 = i + 1$

D3 $[l = 5, i, k = 0, k' = 0]$

$= \dfrac{41}{3960} + \dfrac{23i}{308} + \dfrac{19i^2}{84} + \dfrac{23i^3}{63} + \dfrac{9i^4}{28} + \dfrac{9i^5}{70}$

D3 $[l = 7, i, k = 0, k' = 0]$

$= \dfrac{111}{20020} + \dfrac{112i}{2145} + \dfrac{287i^2}{1320} + \dfrac{23i^3}{44} + \dfrac{19i^4}{24} + \dfrac{23i^5}{30} + \dfrac{9i^6}{20} + \dfrac{9i^7}{70}$

D3 $[l = 9, i, k = 0, k' = 0]$

$= \dfrac{3}{910} + \dfrac{381i}{10010} + \dfrac{999i^2}{5005} + \dfrac{448i^3}{715} + \dfrac{287i^4}{220} + \dfrac{207i^5}{110} + \dfrac{19i^6}{10} + \dfrac{46i^7}{35} + \dfrac{81i^8}{140} + \dfrac{9i^9}{70}$

D3 $[l = 11, i, k = 0, k' = 0]$

$$= \frac{181}{85680} + \frac{891i}{30940} + \frac{33i^2}{182} + \frac{127i^3}{182} + \frac{333i^4}{182} +$$
$$\frac{224i^5}{65} + \frac{287i^6}{60} + \frac{69i^7}{14} + \frac{209i^8}{56} + \frac{253i^9}{126} + \frac{99i^{10}}{140} + \frac{9i^{11}}{70}$$

D3 $[l = 13, i, k = 0, k' = 0]$

$$= \frac{37}{25840} + \frac{871i}{38760} + \frac{2353i^2}{14280} + \frac{891i^3}{1190} + \frac{33i^4}{14} + \frac{381i^5}{70} + \frac{333i^6}{35} +$$
$$\frac{64i^7}{5} + \frac{533i^8}{40} + \frac{299i^9}{28} + \frac{2717i^{10}}{420} + \frac{299i^{11}}{105} + \frac{117i^{12}}{140} + \frac{9i^{13}}{70}$$

D3 $[l = 15, i, k = 0, k' = 0]$

$$= \frac{89}{87780} + \frac{122i}{6783} + \frac{777i^2}{5168} + \frac{6097i^3}{7752} + \frac{2353i^4}{816} + \frac{2673i^5}{340} + \frac{33i^6}{2} + \frac{381i^7}{14} +$$
$$\frac{999i^8}{28} + \frac{112i^9}{3} + \frac{3731i^{10}}{120} + \frac{897i^{11}}{44} + \frac{247i^{12}}{24} + \frac{23i^{13}}{6} + \frac{27i^{14}}{28} + \frac{9i^{15}}{70}$$

D3 $[l = 17, i, k = 0, k' = 0]$

$$= \frac{79}{106260} + \frac{4947i}{336490} + \frac{3026i^2}{21945} + \frac{976i^3}{1197} + \frac{259i^4}{76} + \frac{6097i^5}{570} +$$
$$\frac{2353i^6}{90} + \frac{1782i^7}{35} + \frac{561i^8}{7} + \frac{2159i^9}{21} + \frac{3774i^{10}}{35} + \frac{15232i^{11}}{165} +$$
$$\frac{63427i^{12}}{990} + \frac{391i^{13}}{11} + \frac{323i^{14}}{21} + \frac{1564i^{15}}{315} + \frac{153i^{16}}{140} + \frac{9i^{17}}{70}$$

D3 $[l = 19, i, k = 0, k' = 0]$

$$= \frac{369}{657800} + \frac{1083i}{88550} + \frac{4503i^2}{35420} + \frac{14841i^3}{17710} + \frac{1513i^4}{385} + \frac{488i^5}{35} + \frac{777i^6}{20} +$$
$$\frac{871i^7}{10} + \frac{44707i^8}{280} + \frac{16929i^9}{70} + \frac{10659i^{10}}{35} + \frac{123063i^{11}}{385} + \frac{107559i^{12}}{385} +$$
$$\frac{144704i^{13}}{715} + \frac{13243i^{14}}{110} + \frac{22287i^{15}}{385} + \frac{6137i^{16}}{280} + \frac{437i^{17}}{70} + \frac{171i^{18}}{140} + \frac{9i^{19}}{70}$$

D3 $[l = 5, i, k = 0, k' = 1]$

$$= -\frac{7}{3960} - \frac{25i}{1848} - \frac{11i^2}{252} - \frac{19i^3}{252} - \frac{i^4}{14} - \frac{13i^5}{420}$$

D3 $[l = 7, i, k = 0, k' = 1]$

$$= -\frac{17}{20020} - \frac{217i}{25740} - \frac{49i^2}{1320} - \frac{25i^3}{264} - \frac{11i^4}{72} - \frac{19i^5}{120} - \frac{i^6}{10} - \frac{13i^7}{420}$$

D3 $[l = 9, i, k = 0, k' = 1]$

$$= -\frac{1}{2184} - \frac{111i}{20020} - \frac{153i^2}{5005} - \frac{217i^3}{2145} - \frac{49i^4}{220} - \frac{15i^5}{44} - \frac{11i^6}{30} - \frac{19i^7}{70} - \frac{9i^8}{70} - \frac{13i^9}{420}$$

D3 $[l = 11, i, k = 0, k' = 1]$

$$= -\frac{23}{85680} - \frac{473i}{123760} - \frac{55i^2}{2184} - \frac{37i^3}{364} - \frac{51i^4}{182} -$$
$$\frac{217i^5}{390} - \frac{49i^6}{60} - \frac{25i^7}{28} - \frac{121i^8}{168} - \frac{209i^9}{504} - \frac{11i^{10}}{70} - \frac{13i^{11}}{420}$$

D3 $[l = 13, i, k = 0, k' = 1]$

$$= -\frac{13}{77520} - \frac{637i}{232560} - \frac{299i^2}{14280} - \frac{473i^3}{4760} - \frac{55i^4}{168} - \frac{111i^5}{140} -$$
$$\frac{51i^6}{35} - \frac{31i^7}{15} - \frac{91i^8}{40} - \frac{325i^9}{168} - \frac{1573i^{10}}{1260} - \frac{247i^{11}}{420} - \frac{13i^{12}}{70} - \frac{13i^{13}}{420}$$

D3 $[l = 15, i, k = 0, k' = 1]$

$$= -\frac{29}{263340} - \frac{55i}{27132} - \frac{91i^2}{5168} - \frac{4459i^3}{46512} - \frac{299i^4}{816} - \frac{1419i^5}{1360} - \frac{55i^6}{24} - \frac{111i^7}{28} -$$
$$\frac{153i^8}{28} - \frac{217i^9}{36} - \frac{637i^{10}}{120} - \frac{325i^{11}}{88} - \frac{143i^{12}}{72} - \frac{19i^{13}}{24} - \frac{3i^{14}}{14} - \frac{13i^{15}}{420}$$

D3 $[l = 17, i, k = 0, k' = 1]$

$$= -\frac{2}{26565} - \frac{1037i}{672980} - \frac{986i^2}{65835} - \frac{110i^3}{1197} - \frac{91i^4}{228} -$$
$$\frac{4459i^5}{3420} - \frac{299i^6}{90} - \frac{473i^7}{70} - \frac{935i^8}{84} - \frac{629i^9}{42} - \frac{578i^{10}}{35} - \frac{7378i^{11}}{495} -$$
$$\frac{10829i^{12}}{990} - \frac{425i^{13}}{66} - \frac{187i^{14}}{63} - \frac{323i^{15}}{315} - \frac{17i^{16}}{70} - \frac{13i^{17}}{420}$$

D3 $[l = 19, i, k = 0, k' = 1]$

$$= -\frac{7}{131560} - \frac{1273i}{1062600} - \frac{114i^2}{8855} - \frac{3111i^3}{35420} - \frac{493i^4}{1155} - \frac{11i^5}{7} - \frac{91i^6}{20} -$$
$$\frac{637i^7}{60} - \frac{5681i^8}{280} - \frac{8987i^9}{280} - \frac{3553i^{10}}{84} - \frac{35853i^{11}}{770} - \frac{16473i^{12}}{385} -$$
$$\frac{70091i^{13}}{2145} - \frac{2261i^{14}}{110} - \frac{1615i^{15}}{154} - \frac{3553i^{16}}{840} - \frac{361i^{17}}{280} - \frac{19i^{18}}{70} - \frac{13i^{19}}{420}$$

D3 $[l = 5, i, k = 1, k' = 0]$

$$= \frac{1}{330} + \frac{17i}{792} + \frac{4i^2}{63} + \frac{25i^3}{252} + \frac{i^4}{12} + \frac{13i^5}{420}$$

D3 $[l = 7, i, k = 1, k' = 0]$

$$= \frac{5}{3003} + \frac{133i}{8580} + \frac{7i^2}{110} + \frac{119i^3}{792} + \frac{2i^4}{9} + \frac{5i^5}{24} + \frac{7i^6}{60} + \frac{13i^7}{420}$$

D3 $[l = 9, i, k = 1, k' = 0]$

$$= \frac{11}{10920} + \frac{3i}{260} + \frac{60i^2}{1001} + \frac{133i^3}{715} + \frac{21i^4}{55} + \frac{119i^5}{220} + \frac{8i^6}{15} + \frac{5i^7}{14} + \frac{3i^8}{20} + \frac{13i^9}{420}$$

D3 $[l = 11, i, k = 1, k' = 0]$

$$= \frac{1}{1530} + \frac{253i}{28560} + \frac{121i^2}{2184} + \frac{11i^3}{52} + \frac{50i^4}{91} +$$
$$\frac{133i^5}{130} + \frac{7i^6}{5} + \frac{17i^7}{12} + \frac{22i^8}{21} + \frac{275i^9}{504} + \frac{11i^{10}}{60} + \frac{13i^{11}}{420}$$

D3 $[l = 13, i, k = 1, k' = 0]$

$$= \frac{13}{29070} + \frac{325i}{46512} + \frac{13i^2}{255} + \frac{3289i^3}{14280} + \frac{121i^4}{168} + \frac{33i^5}{20} +$$
$$\frac{20i^6}{7} + \frac{19i^7}{5} + \frac{39i^8}{10} + \frac{221i^9}{72} + \frac{572i^{10}}{315} + \frac{65i^{11}}{84} + \frac{13i^{12}}{60} + \frac{13i^{13}}{420}$$

D3 $[l = 15, i, k = 1, k' = 0]$

$$= \frac{1}{3135} + \frac{3i}{532} + \frac{91i^2}{1938} + \frac{11375i^3}{46512} + \frac{91i^4}{102} + \frac{3289i^5}{1360} + \frac{121i^6}{24} + \frac{33i^7}{4} +$$
$$\frac{75i^8}{7} + \frac{133i^9}{12} + \frac{91i^{10}}{10} + \frac{1547i^{11}}{264} + \frac{26i^{12}}{9} + \frac{25i^{13}}{24} + \frac{i^{14}}{4} + \frac{13i^{15}}{420}$$

D3 $[l = 17, i, k = 1, k' = 0]$

$$= \frac{5}{21252} + \frac{493i}{106260} + \frac{136i^2}{3135} + \frac{34i^3}{133} + \frac{182i^4}{171} +$$
$$\frac{2275i^5}{684} + \frac{364i^6}{45} + \frac{3289i^7}{210} + \frac{2057i^8}{84} + \frac{187i^9}{6} + \frac{680i^{10}}{21} +$$
$$\frac{4522i^{11}}{165} + \frac{3094i^{12}}{165} + \frac{2023i^{13}}{198} + \frac{272i^{14}}{63} + \frac{85i^{15}}{63} + \frac{17i^{16}}{60} + \frac{13i^{17}}{420}$$

D3 $[l = 19, i, k = 1, k' = 0]$

$$= \frac{4}{22425} + \frac{589i}{151800} + \frac{285i^2}{7084} + \frac{9367i^3}{35420} + \frac{68i^4}{55} + \frac{153i^5}{35} +$$
$$\frac{182i^6}{15} + \frac{325i^7}{12} + \frac{247i^8}{5} + \frac{62491i^9}{840} + \frac{39083i^{10}}{420} + \frac{969i^{11}}{10} + \frac{6460i^{12}}{77} +$$
$$\frac{42959i^{13}}{715} + \frac{1938i^{14}}{55} + \frac{5491i^{15}}{330} + \frac{646i^{16}}{105} + \frac{95i^{17}}{56} + \frac{19i^{18}}{60} + \frac{13i^{19}}{420}$$

D3 $[l = 5, i, k = 1, k' = 1]$

$$= -\frac{1}{1980} - \frac{i}{264} - \frac{i^2}{84} - \frac{5i^3}{252} - \frac{i^4}{56} - \frac{i^5}{140}$$

D3 $[l = 7, i, k = 1, k' = 1]$

$$= -\frac{1}{4004} - \frac{7i}{2860} - \frac{7i^2}{660} - \frac{7i^3}{264} - \frac{i^4}{24} - \frac{i^5}{24} - \frac{i^6}{40} - \frac{i^7}{140}$$

D3 $[l = 9, i, k = 1, k' = 1]$

$$= -\frac{1}{7280} - \frac{3i}{1820} - \frac{9i^2}{1001} - \frac{21i^3}{715} - \frac{7i^4}{110} - \frac{21i^5}{220} - \frac{i^6}{10} - \frac{i^7}{14} - \frac{9i^8}{280} - \frac{i^9}{140}$$

D3 $[l = 11, i, k = 1, k' = 1]$

$$= -\frac{1}{12240} - \frac{11i}{9520} - \frac{11i^2}{1456} - \frac{11i^3}{364} - \frac{15i^4}{182} - \frac{21i^5}{130} - \frac{7i^6}{30} - \frac{i^7}{4} - \frac{11i^8}{56} - \frac{55i^9}{504} - \frac{11i^{10}}{280} - \frac{i^{11}}{140}$$

D3 $[l = 13, i, k = 1, k' = 1]$

$$= -\frac{1}{19380} - \frac{13i}{15504} - \frac{13i^2}{2040} - \frac{143i^3}{4760} - \frac{11i^4}{112} - \frac{33i^5}{140} - \frac{3i^6}{7} - \frac{3i^7}{5} - \frac{13i^8}{20} - \frac{13i^9}{24} - \frac{143i^{10}}{420} - \frac{13i^{11}}{84} - \frac{13i^{12}}{280} - \frac{i^{13}}{140}$$

D3 $[l = 15, i, k = 1, k' = 1]$

$$= -\frac{1}{29260} - \frac{i}{1596} - \frac{7i^2}{1292} - \frac{455i^3}{15504} - \frac{91i^4}{816} - \frac{429i^5}{1360} - \frac{11i^6}{16} - \frac{33i^7}{28} - \frac{45i^8}{28} - \frac{7i^9}{4} - \frac{91i^{10}}{60} - \frac{91i^{11}}{88} - \frac{13i^{12}}{24} - \frac{5i^{13}}{24} - \frac{3i^{14}}{56} - \frac{i^{15}}{140}$$

D3 $[l = 17, i, k = 1, k' = 1]$

$$= -\frac{1}{42504} - \frac{17i}{35420} - \frac{34i^2}{7315} - \frac{34i^3}{1197} - \frac{7i^4}{57} - \frac{91i^5}{228} - \frac{91i^6}{90} - \frac{143i^7}{70} - \frac{187i^8}{56} - \frac{187i^9}{42} - \frac{34i^{10}}{7} - \frac{238i^{11}}{55} - \frac{1547i^{12}}{495} - \frac{119i^{13}}{66} - \frac{17i^{14}}{21} - \frac{17i^{15}}{63} - \frac{17i^{16}}{280} - \frac{i^{17}}{140}$$

D3 $[l = 19, i, k = 1, k' = 1]$

$$= -\frac{1}{59800} - \frac{19i}{50600} - \frac{57i^2}{14168} - \frac{969i^3}{35420} - \frac{51i^4}{385} - \frac{17i^5}{35} - \frac{7i^6}{5} - \frac{13i^7}{4} - \frac{247i^8}{40} - \frac{2717i^9}{280} - \frac{3553i^{10}}{280} - \frac{969i^{11}}{70} - \frac{969i^{12}}{77} - \frac{6783i^{13}}{715} - \frac{323i^{14}}{55} - \frac{323i^{15}}{110} - \frac{323i^{16}}{280} - \frac{19i^{17}}{56} - \frac{19i^{18}}{280} - \frac{i^{19}}{140}$$

D3 $[l = 3, i, k = 0, k' = 0]$

$$= \frac{1}{840} \left(19 + 92i + 162i^2 + 108i^3 \right)$$

D3 $[l = 1, i, k = 0, k' = 0]$

$$= \frac{1}{140}(9 + 18i)$$

D3 $[l = -1, i, k = 0, k' = 0]$

$= \frac{1}{232792560 i^{18}}$

$\left(-34918884 + 13477464i + 90462372i^2 + 44620576i^3 - 333333i^4 + 402402i^5 - 491777i^6 + 609444i^7 - 767448i^8 + 984504i^9 - 1290708i^{10} + 1736448i^{11} - 2410226i^{12} + 3476772i^{13} - 5265546i^{14} + 8498776i^{15} - 14965236i^{16} + 29930472i^{17}\right) + \left(3i^2 + 2i^3 - 9i^4 - 12i^5 - 4i^6\right) \text{Log20}[i]$

D3 $[l = -3, i, k = 0, k' = 0]$

$=$

$\frac{1}{77597520 i^{20}} \left(-11639628 - 11027016i + 221084864i^2 + 232872640i^3 - 11666655i^4 + 12206194i^5 - 12786202i^6 + 13407768i^7 - 14069880i^8 + 14767560i^9 - 15488496i^{10} + 16206848i^{11} - 16871582i^{12} + 17383860i^{13} - 17551820i^{14} + 16997552i^{15} - 14965236i^{16} + 9976824i^{17}\right) +$
$\left(3 + 6i - 54i^2 - 120i^3 - 60i^4\right) \text{Log20}[i]$

D3 $[l = -5, i, k = 0, k' = 0]$

$= \frac{1}{77597520 i^{20} (1+i)^2}$

$\left(34918884 + 265873608i + 453537084i^2 + 221661440i^3 + 45045i^4 - 42042i^5 + 35321i^6 - 22572i^7 + 38760i^9 - 104652i^{10} + 217056i^{11} - 411502i^{12} + 755820i^{13} - 1385670i^{14} + 2586584i^{15} - 4988412i^{16} + 9976824i^{17}\right) + \left(-9 - 60i - 60i^2\right) \text{Log20}[i]$

D3 $[l = -7, i, k = 0, k' = 0]$

$= \frac{1}{58198140 i^{20} (1+i)^4}$

$\left(11639628 + 34306272i + 33761728i^2 + 11083072i^3 + 3003i^4 - 4004i^5 + 5434i^6 - 7524i^7 + 10659i^8 - 15504i^9 + 23256i^{10} - 36176i^{11} + 58786i^{12} - 100776i^{13} + 184756i^{14} - 369512i^{15} + 3741309i^{16} + 7482618i^{17}\right) - 4\text{Log20}[i]$

D3 $[l = -9, i, k = 0, k' = 0]$

$= \frac{5 + 28i + 54i^2 + 36i^3}{280 i^6 (1+i)^6}$

D3 $[l = -11, i, k = 0, k' = 0]$

$= \frac{7 + 54i + 174i^2 + 296i^3 + 270i^4 + 108i^5}{840 i^8 (1+i)^8}$

D3 $[l = 3, i, k = 0, k' = 1]$

$$= \frac{-11 - 57i - 108i^2 - 78i^3}{2520}$$

D3 $[l = 1, i, k = 0, k' = 1]$

$$= \frac{1}{420}(-6 - 13i)$$

D3 $[l = -1, i, k = 0, k' = 1]$

$$= \frac{1}{232792560i^{18}}$$
$$(11639628 - 612612i - 34238204i^2 - 22202180i^3 + 39039i^4 - 49049i^5 + 62491i^6 -$$
$$80883i^7 + 106590i^8 - 143412i^9 + 197676i^{10} - 280364i^{11} + 411502i^{12} -$$
$$629850i^{13} + 1016158i^{14} - 1755182i^{15} + 3325608i^{16} - 7205484i^{17}) +$$
$$(-i^2 - i^3 + 3i^4 + 5i^5 + 2i^6) \text{Log20}[i]$$

D3 $[l = -3, i, k = 0, k' = 1]$

$$=$$

$$\frac{1}{232792560i^{20}} (11639628 + 22666644i - 233337104i^2 - 336336000i^3 + 4099095i^4 -$$
$$4463459i^5 + 4874298i^6 - 5338278i^7 + 5862450i^8 - 6453540i^9 + 7116336i^{10} -$$
$$7850192i^{11} + 8641542i^{12} - 9447750i^{13} + 10161580i^{14} - 10531092i^{15} +$$
$$9976824i^{16} - 7205484i^{17}) + (-1 - 3i + 18i^2 + 50i^3 + 30i^4) \text{Log20}[i]$$

D3 $[l = -5, i, k = 0, k' = 1]$

$$= \frac{1}{232792560i^{20}(1 + i)}$$
$$(-34918884 - 289152864i - 335915580i^2 + 3643640i^3 - 3968965i^4 +$$
$$4336332i^5 - 4752033i^6 + 5222910i^7 - 5755860i^8 + 6356640i^9 - 7027188i^{10} +$$
$$7759752i^{11} - 8523970i^{12} + 9237800i^{13} - 9699690i^{14} +$$
$$9422556i^{15} - 7205484i^{16}) + (3 + 25i + 30i^2) \text{Log20}[i]$$

D3 $[l = -7, i, k = 0, k' = 1]$

$$=$$

$$\frac{1}{116396280i^{20}(1 + i)^3} (-11639628 - 22666644i - 11095084i^2 + 12012i^3 - 15015i^4 +$$
$$19019i^5 - 24453i^6 + 31977i^7 - 42636i^8 + 58140i^9 - 81396i^{10} + 117572i^{11} -$$
$$176358i^{12} + 277134i^{13} - 461890i^{14} + 831402i^{15} - 3602742i^{16}) + 2\text{Log20}[i]$$

D3 $[l = -9, i, k = 0, k' = 1]$

$$= \frac{-5 - 22i - 26i^2}{840i^6(1 + i)^5}$$

D3 $[l = -11, i, k = 0, k' = 1]$

$= \dfrac{-7 - 46i - 120i^2 - 150i^3 - 78i^4}{2520i^8(1 + i)^7}$

D3 $[l = 3, i, k = 1, k' = 0]$

$= \dfrac{16 + 75i + 126i^2 + 78i^3}{2520}$

D3 $[l = 1, i, k = 1, k' = 0]$

$= \dfrac{1}{420}(7 + 13i)$

D3 $[l = -1, i, k = 1, k' = 0]$

$= \dfrac{1}{232792560i^{17}}$

$(34918884 + 56360304i + 22258236i^2 - 104104i^3 + 125125i^4 - 152152i^5 +$
$187473i^6 - 234498i^7 + 298452i^8 - 387600i^9 + 515508i^{10} - 705432i^{11} +$
$999362i^{12} - 1478048i^{13} + 2309450i^{14} - 3879876i^{15} + 7205484i^{16}) +$
$\left(-3i^3 - 8i^4 - 7i^5 - 2i^6\right) \text{Log20}[i]$

D3 $[l = -3, i, k = 1, k' = 0]$

$= \dfrac{1}{232792560i^{19}}$

$(104756652 + 448431984i + 343062720i^2 - 10930920i^3 + 11386375i^4 -$
$11867856i^5 + 12373218i^6 - 12897390i^7 + 13430340i^8 - 13953600i^9 +$
$14434224i^{10} - 14814072i^{11} + 14990430i^{12} - 14780480i^{13} + 13856700i^{14} -$
$11639628i^{15} + 7205484i^{16}) + \left(-9i - 48i^2 - 70i^3 - 30i^4\right) \text{Log20}[i]$

D3 $[l = -5, i, k = 1, k' = 0]$

$= \dfrac{1}{232792560i^{20}(1 + i)^2}$

$(93117024 + 495603108i + 735678944i^2 + 332552220i^3 + 13013i^5 - 32604i^6 +$
$62073i^7 - 106590i^8 + 174420i^9 - 279072i^{10} + 443156i^{11} - 705432i^{12} +$
$1133730i^{13} - 1847560i^{14} + 3048474i^{15} - 4988412i^{16} +$
$7205484i^{17}) + \left(-8 - 35i - 30i^2\right) \text{Log20}[i]$

D3 $[l = -7, i, k = 1, k' = 0]$

$= \dfrac{1}{116396280i^{20}(1 + i)^4}$

$(11639628 + 34306272i + 33761728i^2 + 11083072i^3 + 3003i^4 - 4004i^5 +$
$5434i^6 - 7524i^7 + 10659i^8 - 15504i^9 + 23256i^{10} - 36176i^{11} + 58786i^{12} -$
$100776i^{13} + 184756i^{14} - 369512i^{15} + 831402i^{16} + 3602742i^{17}) - 2\text{Log20}[i]$

D3 $[l = -9, i, k = 1, k' = 0]$

$$= \frac{9 + 30i + 26i^2}{840i^5(1+i)^6}$$

D3 $[l = -11, i, k = 1, k' = 0]$

$$= \frac{9 + 56i + 138i^2 + 162i^3 + 78i^4}{2520i^7(1+i)^8}$$

D3 $[l = 3, i, k = 1, k' = 1]$

$$= \frac{1}{840}\left(-1 - 5i - 9i^2 - 6i^3\right)$$

D3 $[l = 1, i, k = 1, k' = 1]$

$$= \frac{1}{280}(-1 - 2i)$$

D3 $[l = -1, i, k = 1, k' = 1]$

$$= \frac{1}{232792560i^{17}}$$
$$\left(-11639628 - 22666644i - 11095084i^2 + 12012i^3 - 15015i^4 + 19019i^5 - 24453i^6 + 31977i^7 - 42636i^8 + 58140i^9 - 81396i^{10} + 117572i^{11} - 176358i^{12} + 277134i^{13} - 461890i^{14} + 831402i^{15} - 1662804i^{16}\right) + \left(i^3 + 3i^4 + 3i^5 + i^6\right)\text{Log20}[i]$$

D3 $[l = -3, i, k = 1, k' = 1]$

$$= \frac{1}{77597520i^{19}}$$
$$\left(-11639628 - 57585528i - 55815760i^2 + 420420i^3 - 455455i^4 + 494494i^5 - 537966i^6 + 586245i^7 - 639540i^8 + 697680i^9 - 759696i^{10} + 823004i^{11} - 881790i^{12} + 923780i^{13} - 923780i^{14} + 831402i^{15} - 554268i^{16}\right) + \left(3i + 18i^2 + 30i^3 + 15i^4\right)\text{Log20}[i]$$

D3 $[l = -5, i, k = 1, k' = 1]$

$$=$$

$$\frac{1}{77597520i^{20}(1+i)}\left(-11639628 - 57585528i - 55815760i^2 + 420420i^3 - 455455i^4 + 494494i^5 - 537966i^6 + 586245i^7 - 639540i^8 + 697680i^9 - 759696i^{10} + 823004i^{11} - 881790i^{12} + 923780i^{13} - 923780i^{14} + 831402i^{15} - 554268i^{16}\right) + \left(3 + 15i + 15i^2\right)\text{Log20}[i]$$

D3 $[l = -7, i, k = 1, k' = 1]$

$=$

$\frac{1}{232792560i^{20}(1+i)^3}\left(-11639628 - 22666644i - 11095084i^2 + 12012i^3 - 15015i^4 + \right.$

$19019i^5 - 24453i^6 + 31977i^7 - 42636i^8 + 58140i^9 - 81396i^{10} + 117572i^{11} -$

$\left. 176358i^{12} + 277134i^{13} - 461890i^{14} + 831402i^{15} - 1662804i^{16}\right) + \text{Log20}[i]$

D3 $[l = -9, i, k = 1, k' = 1]$

$= \frac{-1 - 2i}{280i^5(1+i)^5}$

D3 $[l = -11, i, k = 1, k' = 1]$

$= \frac{-1 - 5i - 9i^2 - 6i^3}{840i^7(1+i)^7}$

S-22.4   Analytic formulas of the integrals Q

Case 1: $i_1 = i_2 = i_3 = i_4 = 0$

Q1 $[l, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{14419218 + 11762731l + 3970469l^2 + 692106l^3 + 61820l^4 + 2248l^5}{12932920(3+l)(4+l)(5+l)(6+l)(9+2l)(11+2l)}$

Q1 $[l, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= (78116973 + 87228356l +$

$40546448l^2 + 10131560l^3 + 1441420l^4 + 110608l^5 + 3568l^6)\Big/$

$(38798760(3+l)(4+l)(5+l)(6+l)(7+2l)(9+2l)(11+2l))$

Q1 $[l, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \frac{10103280 + 8108438l + 2677539l^2 + 456697l^3 + 39984l^4 + 1428l^5}{58198140(4+l)(5+l)(6+l)(7+2l)(9+2l)(11+2l)}$

Q1 $[l, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \frac{5853837 + 4916959l + 1674971l^2 + 292854l^3 + 26180l^4 + 952l^5}{77597520(3+l)(4+l)(5+l)(6+l)(9+2l)(11+2l)}$

Q1 $[l, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \frac{1770714 + 1443507l + 479012l^2 + 81836l^3 + 7168l^4 + 256l^5}{38798760(4+l)(5+l)(6+l)(7+2l)(9+2l)(11+2l)}$

Q1 $[l, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \frac{15378 + 8387l + 1870l^2 + 196l^3 + 8l^4}{8953560\left(11880 + 12126l + 4925l^2 + 995l^3 + 100l^4 + 4l^5\right)}$

Case 2: $i_1 = i_2 = i_3 = i_4 = i > 0$

Q2 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{12221609400} \left(-3256159i + 143605800i^2 - 213050728i^3 + 1923477920i^4 - 1176239232i^5 + 7119018192i^6 - 2184761664i^7 + 6744333024i^8\right)$

Q2 $[l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{678978300} \left(-845655i + 14578928i^2 - 59452806i^3 + 229265400i^4 - 349081376i^5 + 638886248i^6 - 364126944i^7 + 374685168i^8\right)$

Q2 $[l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{291281690700i^{19}}$

$\left(-33693660 + 453332880i - 2775420648i^2 + 10144278144i^3 - 24151042916i^4 + 37022457472i^5 - 27718294989i^6 - 26190987284i^7 + 124496397157i^8 - 230717277012i^9 + 288930949056i^{10} - 265198213020i^{11} + 177727185372i^{12} - 81592834868i^{13} + 20742015240i^{14} + 1819784340i^{15} - 5562470017i^{16} + 4743124204i^{17} - 8261762340i^{18} + 18450573960i^{19} - 45620475472i^{20} + 112909934280i^{21} - 232712695358i^{22} + 395038258472i^{23} - 468442534560i^{24} + 482906734024i^{25} - 260350764960i^{26} + 160739937072i^{27}\right) +$

$\dfrac{1}{10010} \left(\left(11 - 148i + 852i^2 - 2540i^3 + 2917i^4 + 6660i^5 - 35292i^6 + 69360i^7 - 56610i^8 - 57256i^9 + 252824i^{10} - 419016i^{11} + 445978i^{12} - 331160i^{13} + 170136i^{14} - 54672i^{15} + 6375i^{16} + 2556i^{17} - 940i^{18} - 172i^{19} + 177i^{20} - 44i^{21} + 4i^{22}\right) \text{Log20}[-i]\right) + \dfrac{1}{10010}$

$\left(\left(-11 + 148i - 852i^2 + 2628i^3 - 4101i^4 + 420i^5 + 11068i^6 - 20048i^7 + 8898i^8 + 19400i^9 - 33592i^{10} + 14040i^{11} + 16198i^{12} - 23424i^{13} + 8328i^{14} + 4816i^{15} - 6375i^{16} + 2556i^{17} + 940i^{18} - 172i^{19} - 177i^{20} - 44i^{21} - 4i^{22}\right) \text{Log20}[i]\right)$

$Q2\,[l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{5401951354800 i^{19}}$

$\left(-1648538892 + 25604731152 i - 169087318400 i^2 + 576085910400 i^3 - \right.$
$724222295797 i^4 - 2469914298852 i^5 + 15789614925942 i^6 - 45406087414248 i^7 +$
$86931950486760 i^8 - 121064070372624 i^9 + 126122854880384 i^{10} -$
$98209797669104 i^{11} + 55349470247544 i^{12} -$
$20094055628080 i^{13} + 1737086057872 i^{14} + 4243160439504 i^{15} -$
$5701174528452 i^{16} + 6773181363312 i^{17} - 8783170203600 i^{18} +$
$11695854423968 i^{19} - 15546058075990 i^{20} + 19988890374960 i^{21} -$
$23573096744288 i^{22} + 24465386832640 i^{23} - 20685659065344 i^{24} +$
$\left. 14764843730208 i^{25} - 6759652588416 i^{26} + 2980995196608 i^{27}\right) +$

$\dfrac{1}{92820} \left(\left(-299 + 5242 i - 40257 i^2 + 170504 i^3 - 371290 i^4 - 79488 i^5 + 3625284 i^6 - \right.\right.$
$14409744 i^7 + 35123598 i^8 - 61830020 i^9 + 82843618 i^{10} - 86115744 i^{11} +$
$69549584 i^{12} - 43017208 i^{13} + 19617660 i^{14} - 6006576 i^{15} + 874293 i^{16} +$
$\left.\left. 130842 i^{17} - 73769 i^{18} - 2600 i^{19} + 8370 i^{20} - 2200 i^{21} + 200 i^{22}\right) \mathrm{Log20}[-i]\right) +$

$\dfrac{1}{92820} \left(\left(299 - 4046 i + 21681 i^2 - 47824 i^3 - 46790 i^4 + 605808 i^5 - 1836612 i^6 + \right.\right.$
$2959632 i^7 - 2173518 i^8 - 1314100 i^9 + 5238142 i^{10} - 5951088 i^{11} +$
$2697968 i^{12} + 1380808 i^{13} - 3069180 i^{14} + 2267664 i^{15} - 874293 i^{16} +$
$\left.\left. 130842 i^{17} + 73769 i^{18} - 2600 i^{19} - 8370 i^{20} - 2200 i^{21} - 200 i^{22}\right) \mathrm{Log20}[i]\right)$

$Q2\left[l=4,k_1=0,k_2=0,k_3=0,k_4=0\right]$

$= \dfrac{1}{1315859945400i^{19}}$

$\left(1911349440 - 33620146560i + 278152094220i^2 - 1436740865560i^3 + \right.$

$5184567360973i^4 - 13849928654562i^5 + 28289625139347i^6 -$

$44918290892244i^7 + 55599937073070i^8 - 52786943834808i^9 +$

$36069899471616i^{10} - 13038761309256i^{11} - 6871993753288i^{12} +$

$18975492849240i^{13} - 24320843570360i^{14} + 26203055971608i^{15} -$

$27010865637522i^{16} + 27576524122056i^{17} - 27923405594760i^{18} +$

$27773580000816i^{19} - 26756522900277i^{20} + 24456896824152i^{21} -$

$20621757158784i^{22} + 15566587890880i^{23} - 10037608858368i^{24} +$

$\left. 5483286858192i^{25} - 2117034052416i^{26} + 726139855584i^{27}\right) +$

$\dfrac{1}{45220}\left(\left(117 - 2838i + 31543i^2 - 215576i^3 + 1021630i^4 - 3580512i^5 + 9647364i^6 - \right.\right.$

$20480784i^7 + 34789038i^8 - 47694180i^9 + 52932594i^{10} - 47431904i^{11} +$

$33995104i^{12} - 19113848i^{13} + 8120220i^{14} - 2403120i^{15} + 384693i^{16} +$

$\left.19722i^{17} - 21489i^{18} + 1080i^{19} + 1546i^{20} - 440i^{21} + 40i^{22}\right)\text{Log20}[-i]\bigr) +$

$\dfrac{1}{45220}\left(\left(-117 + 1278i - 4103i^2 - 11664i^3 + 154850i^4 - 683088i^5 + \right.\right.$

$1825596i^6 - 3240336i^7 + 3660882i^8 - 1686060i^9 - 2544594i^{10} + 6785584i^{11} -$

$8465184i^{12} + 7020728i^{13} - 4089180i^{14} + 1627920i^{15} - 384693i^{16} +$

$\left.\left.19722i^{17} + 21489i^{18} + 1080i^{19} - 1546i^{20} - 440i^{21} - 40i^{22}\right)\text{Log20}[i]\right)$

$Q2 [l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{21711689099100 i^{19}(1+i)^2}$

$(-1510088580 + 26630243640i - 219848068440i^2 + 1125481036680i^3 -$
$3985229876628i^4 + 10288325711664i^5 - 19815241401648i^6 +$
$28412205544800i^7 - 29078473604040i^8 + 17817899661072i^9 +$
$928917162544i^{10} - 16500003580368i^{11} + 20890780884600i^{12} -$
$14782685702400i^{13} + 4782857363328i^{14} + 3475433291616i^{15} -$
$8713896055249i^{16} + 12551269182606i^{17} - 17069488272837i^{18} +$
$24068457738628i^{19} - 35535372202538i^{20} + 53203724565668i^{21} -$
$76057920652296i^{22} + 99214286241532i^{23} - 109287541297858i^{24} +$
$107237570860112i^{25} - 76062684884208i^{26} +$
$55982149334232i^{27} - 18730904822784i^{28} + 11981307617136i^{29}) +$

$\dfrac{1}{746130} ((493 - 9680i + 90090i^2 - 528220i^3 + 2187185i^4 - 6794172i^5 +$
$16414860i^6 - 31550640i^7 + 48924810i^8 - 61680080i^9 + 63371308i^{10} -$
$52907400i^{11} + 35565530i^{12} - 18901960i^{13} + 7674480i^{14} - 2217072i^{15} +$
$373065i^{16} - 14630i^{18} + 1540i^{19} + 693i^{20} - 220i^{21} + 20i^{22}) \text{Log20}[-i]) +$

$\dfrac{1}{746130} ((-493 + 9680i - 90090i^2 + 528220i^3 - 2187185i^4 + 6794172i^5 -$
$16414860i^6 + 31550640i^7 - 48924810i^8 + 61680080i^9 - 63371308i^{10} +$
$52907400i^{11} - 35565530i^{12} + 18901960i^{13} - 7674480i^{14} + 2217072i^{15} -$
$373065i^{16} + 14630i^{18} + 1540i^{19} - 693i^{20} - 220i^{21} - 20i^{22}) \text{Log20}[i])$

$Q2 [l = 6, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$=$

$\dfrac{1}{3603807900 i^5 (1+i)^4} (-10336 + 182648i - 1427524i^2 + 6276264i^3 - 15489584i^4 +$
$11900272i^5 + 57584599i^6 - 228225588i^7 + 403488036i^8 + 95596004i^9 -$
$1043924851i^{10} + 4814188880i^{11} - 4811068194i^{12} + 10339640248i^{13} -$
$3813464768i^{14} + 7659893320i^{15} - 420065376i^{16} + 1988713584i^{17})$

$Q2 [l = 7, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{156165009000 i^7 (1+i)^6}$

$(-94962 + 1680892i - 13260442i^2 + 59739496i^3 - 158187958i^4 + 188656548i^5 +$
$241240302i^6 - 1421582432i^7 + 2411193893i^8 - 356916474i^9 -$
$3989251069i^{10} + 18158657180i^{11} + 11873717815i^{12} + 75835847710i^{13} +$
$122508462585i^{14} + 333133796760i^{15} + 243083407400i^{16} + 632878397840i^{17} +$
$239176672480i^{18} + 438554076880i^{19} + 98319546240i^{20} + 86177588640i^{21})$

$\text{Q2}[l=0, k_1=0, k_2=0, k_3=0, k_4=1]$

$= \dfrac{1}{146659312800} \left(-924835 + 55124472i - 120929244i^2 + 1701669944i^3 - 1353498345i^4 + 10439083512i^5 - 3367352520i^6 + 14526255744i^7\right)$

$\text{Q2}[l=1, k_1=0, k_2=0, k_3=0, k_4=1]$

$= \dfrac{1}{16295479200} \left(-522807 + 12149968i - 68300526i^2 + 361886616i^3 - 681036475i^4 + 1689039352i^5 - 1122450840i^6 + 1614028416i^7\right)$

$\text{Q2}[l=2, k_1=0, k_2=0, k_3=0, k_4=1]$

$=$

$\dfrac{1}{6990760576800i^{19}} \left(116396280 - 1907673768i + 14179733568i^2 - 61655818224i^3 + 166158624632i^4 - 250170951030i^5 + 22049152818i^6 + 895288088948i^7 - 2471076246894i^8 + 3929473346202i^9 - 4263922743120i^{10} + 3241870034520i^{11} - 1658791287744i^{12} + 489085041792i^{13} - 628456176i^{14} - 76858798752i^{15} - 980566288i^{16} + 9319929528i^{17} - 6969923441i^{19} + 51968167680i^{20} - 188010992598i^{21} + 496078358776i^{22} - 815655694425i^{23} + 1178601017880i^{24} - 802552350600i^{25} + 692418190464i^{26}\right) +$

$\dfrac{1}{120120} \left(\left(-19 + 186i - 402i^2 - 3056i^3 + 25401i^4 - 89226i^5 + 172176i^6 - 122400i^7 - 314262i^8 + 1235492i^9 - 2304588i^{10} + 2885376i^{11} - 2598518i^{12} + 1687692i^{13} - 750312i^{14} + 187680i^{15} + 2601i^{16} - 17406i^{17} + 2126i^{18} + 2544i^{19} - 1347i^{20} + 286i^{21} - 24i^{22}\right) \text{Log20}[-i]\right) +$

$\dfrac{1}{120120} \left(\left(19 - 186i + 666i^2 - 648i^3 - 2409i^4 + 8274i^5 - 7112i^6 - 10560i^7 + 29142i^8 - 16900i^9 - 22308i^{10} + 40560i^{11} - 13650i^{12} - 19740i^{13} + 18456i^{14} - 9216i^{15} + 2601i^{16} + 17406i^{17} + 2126i^{18} - 2544i^{19} - 1347i^{20} - 286i^{21} - 24i^{22}\right) \text{Log20}[i]\right)$

$Q2\left[l=3, k_1=0, k_2=0, k_3=0, k_4=1\right]$

$=\dfrac{1}{64823416257600i^{20}}$

$\left(-3480248772 + 56965564656i - 367879768256i^2 + 981993444432i^3 + \right.$
$1311839423895i^4 - 21194455622340i^5 + 90954902631450i^6 - 243535587603660$
$i^7 + 465770121728175i^8 - 667510216767900i^9 + 729355002216228i^{10} - $
$606650178105344i^{11} + 375791991555864i^{12} - 163374440300448i^{13} + $
$41727950060560i^{14} - 717764562144i^{15} - 3818927463660i^{16} - $
$700124329632i^{17} + 769342654080i^{18} - 1197741610858i^{20} + 3944867853264i^{21} - $
$8368708674144i^{22} + 13804422584368i^{23} - 16989663968550i^{24} + $
$\left. 17243616692016i^{25} - 10418588696880i^{26} + 6420605038848i^{27}\right) + $

$\dfrac{1}{556920}\left(\left(563 - 8334i + 47364i^2 - 72908i^3 - 656295i^4 + 5338566i^5 - \right.\right.$
$21591768i^6 + 59439888i^7 - 121555746i^8 + 191651540i^9 - $
$236818296i^{10} + 230177688i^{11} - 174580718i^{12} + 100924716i^{13} - $
$42142320i^{14} + 11005392i^{15} - 755361i^{16} - 560934i^{17} + 135188i^{18} + $
$\left.\left. 47700i^{19} - 32475i^{20} + 7150i^{21} - 600i^{22}\right) \mathrm{Log}20[-i]\right) + $

$\dfrac{1}{556920}\left(\left(35 - 2010i + 21840i^2 - 111820i^3 + 319725i^4 - 481950i^5 + \right.\right.$
$85680i^6 + 1187280i^7 - 2467890i^8 + 2011100i^9 + 583440i^{10} - 3155880i^{11} + $
$3264170i^{12} - 1135260i^{13} - 930240i^{14} + 1405968i^{15} - 755361i^{16} + $
$\left.\left. 560934i^{17} + 135188i^{18} - 47700i^{19} - 32475i^{20} - 7150i^{21} - 600i^{22}\right) \mathrm{Log}20[i]\right)$

Q2 $[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{15790319344800 i^{20}}$

$\big(1815781968 - 35369766432i + 324852419892i^2 - 1868727724864i^3 +$

$7542188213560i^4 - 22666698552498i^5 + 52524767803365i^6 -$

$95839906888110i^7 + 139335714329955i^8 - 162157512588870i^9 +$

$150787562943954i^{10} - 111076595628912i^{11} + 63855197679872i^{12} -$

$28296093204144i^{13} + 10236831028360i^{14} - 4382867202192i^{15} +$

$3266646278310i^{16} - 2850506199216i^{17} + 1642605466320i^{18} -$

$2123046851487i^{20} + 4625414530152i^{21} - 6977593192392i^{22} +$

$8381781009784i^{23} - 7993871261505i^{24} + 6251319397752i^{25} -$

$3262964591880i^{26} + 1563993535104i^{27}\big) + \dfrac{1}{271320}$

$\big(\big({-417} + 9386i - 98596i^2 + 644372i^3 - 2943195i^4 + 9995406i^5 - 26194008i^6 +$

$54217488i^7 - 89917386i^8 + 120407940i^9 - 130437736i^{10} + 113843288i^{11} -$

$79117558i^{12} + 42756156i^{13} - 17131920i^{14} + 4542672i^{15} - 493221i^{16} -$

$131214i^{17} + 48108i^{18} + 5300i^{19} - 6175i^{20} + 1430i^{21} - 120i^{22}\big) \text{Log20}[-i]\big) +$

$\dfrac{1}{271320} \big(\big({-207} + 2990i - 19080i^2 + 68020i^3 - 131385i^4 + 40698i^5 +$

$542640i^6 - 1782960i^7 + 3110490i^8 - 3275220i^9 + 1478048i^{10} + 1511640i^{11} -$

$3821090i^{12} + 4205460i^{13} - 3023280i^{14} + 1503888i^{15} - 493221i^{16} +$

$131214i^{17} + 48108i^{18} - 5300i^{19} - 6175i^{20} - 1430i^{21} - 120i^{22}\big) \text{Log20}[i]\big)$

$Q2\,[l=5, k_1=0, k_2=0, k_3=0, k_4=1]$

$=$

$\frac{1}{1042161076756800i^{20}(1+i)^2}\left(17215009812 - 292606770456i + 2313819800292i^2 - \right.$

$11252648206800i^3 + 37419575238045i^4 - 89192760110454i^5 +$

$154233732803007i^6 - 187999409030664i^7 + 140731015727115i^8 -$

$14339386674390i^9 - 117513970085715i^{10} + 169377056097340i^{11} -$

$124245143300740i^{12} + 39063892534480i^{13} + 23111087535800i^{14} -$

$45857674848128i^{15} + 49276109520968i^{16} - 54413879664144i^{17} +$

$68576020983624i^{18} - 95019280644288i^{19} + 134907442133978i^{20} -$

$189439649614892i^{21} + 242211693580502i^{22} - 254189731953784i^{23} +$

$204746382346198i^{24} - 64357467125644i^{25} - 13991010584166i^{26} +$

$\left. 158589175819536i^{27} - 56765330444592i^{28} + 103223573316864i^{29}\right) +$

$\frac{1}{1790712}\left(\left(-475 + 9306i - 86394i^2 + 505120i^3 - 2084775i^4 + 6451830i^5 - \right.\right.$

$15519504i^6 + 29674656i^7 - 45727110i^8 + 57203300i^9 - 58198140i^{10} +$

$47969376i^{11} - 31685654i^{12} + 16414860i^{13} - 6395400i^{14} + 1705440i^{15} -$

$\left. 223839i^{16} - 26334i^{17} + 14630i^{18} - 1155i^{20} + 286i^{21} - 24i^{22}\right)\text{Log20}[-i]\right) +$

$\frac{1}{8953560}\left(\left(-583 + 11550i - 108570i^2 + 643720i^3 - 2699235i^4 + 8505882i^5 - \right.\right.$

$20891640i^6 + 40930560i^7 - 64913310i^8 + 84063980i^9 - 89237148i^{10} +$

$77597520i^{11} - 54964910i^{12} + 31337460i^{13} - 14069880i^{14} + 4775232i^{15} -$

$\left.\left. 1119195i^{16} + 131670i^{17} + 73150i^{18} - 5775i^{20} - 1430i^{21} - 120i^{22}\right)\text{Log20}[i]\right)$

$Q2\,[l=6, k_1=0, k_2=0, k_3=0, k_4=1]$

$=\frac{1}{86491389600i^6(1+i)^4}$

$\left(103360 - 1788536i + 13877304i^2 - 62339272i^3 + 170543048i^4 - 245983608i^5 - \right.$

$57866199i^6 + 1121847948i^7 - 2471506344i^8 + 2532485932i^9 +$

$1831605598i^{10} - 5217050532i^{11} + 16713822896i^{12} - 2473823788i^{13} +$

$\left. 18505736451i^{14} + 13270392984i^{15} + 8450695512i^{16} + 8566766208i^{17}\right)$

$Q2\,[l=7, k_1=0, k_2=0, k_3=0, k_4=1]$

$=\frac{1}{1873980108000i^8(1+i)^6}$

$\left(664734 - 11590532i + 90298526i^2 - 404008400i^3 + 1079444036i^4 - \right.$

$1411701216i^5 - 939988140i^6 + 7770266296i^7 - 13874847529i^8 + 5513593914i^9 +$

$24082479029i^{10} - 44325650260i^{11} + 48439885750i^{12} + 102963921520i^{13} +$

$106306307970i^{14} + 419529266700i^{15} + 743613310385i^{16} + 754376463410i^{17} +$

$\left. 1094130960475i^{18} + 748966521400i^{19} + 468270374040i^{20} + 185613267840i^{21}\right)$

$Q2\left[l=0, k_1=0, k_2=0, k_3=1, k_4=1\right]$

$= \frac{1}{73329656400}\left(873392 - 3004297i + 43316884i^2 - 41124974i^3 + \right.$
$\left. 543182640i^4 - 223709895i^5 + 1222160940i^6 + 180373536i^7\right)$

$Q2\left[l=1, k_1=0, k_2=0, k_3=1, k_4=1\right]$

$= \frac{1}{24443218800}\left(578816 - 5391891i + 32097156i^2 - \right.$
$62428898i^3 + 181060880i^4 - 37621311i^5 + 190113924i^6 + 180373536i^7\big)$

$Q2\left[l=2, k_1=0, k_2=0, k_3=1, k_4=1\right]$

$=$

$\frac{1}{3495380288400i^{18}}\left(104756652 - 1389404016i + 7932564640i^2 - 24227291088i^3 + \right.$
$34923449561i^4 + 21927565660i^5 - 224013019780i^6 + 547969052708i^7 - $
$804692328845i^8 + 788731063904i^9 - 508791350864i^{10} + $
$186192650504i^{11} - 711687608i^{12} - 37156456000i^{13} - 1517066096i^{14} + $
$2179345376i^{15} - 3810323764i^{16} + 8552211148i^{17} - 12467334880i^{18} + $
$23878004865i^{19} - 41342665364i^{20} + 63553431942i^{21} - 68797961232i^{22} + $
$79735812585i^{23} - 34953802884i^{24} + 42989026080i^{25}\big) + $

$\frac{1}{60060}\left(\left(19i - 290i^2 + 2002i^3 - 8100i^4 + 20343i^5 - 28050i^6 - 2856i^7 + \right.\right.$
$113424i^8 - 299370i^9 + 476476i^{10} - 531284i^{11} + 426088i^{12} - $
$237354i^{13} + 78540i^{14} - 2856i^{15} - 10608i^{16} + 3927i^{17} + $
$678i^{18} - 1070i^{19} + 412i^{20} - 77i^{21} + 6i^{22}\big) \mathrm{Log20}[-i]\big) + $

$\frac{1}{60060}\left(\left(-19i + 214i^2 - 994i^3 + 2260i^4 - 1639i^5 - 4082i^6 + 11368i^7 - 8272i^8 - \right.\right.$
$8534i^9 + 20748i^{10} - 10764i^{11} - 9672i^{12} + 14898i^{13} - 6468i^{14} - 2856i^{15} + $
$10608i^{16} + 3927i^{17} - 678i^{18} - 1070i^{19} - 412i^{20} - 77i^{21} - 6i^{22}\big) \mathrm{Log20}[i]\big)$

Q2 $[l = 3, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{32411708128800 i^{20}}$

$\big(1024287264 - 15748416684i + 92577789304i^2 - 187909746024i^3 -$
$705795690600i^4 + 6465264859053i^5 - 24371722611522i^6 + 59498951040672i^7 -$
$104133933028488i^8 + 135458417960745i^9 - 131974051530090i^{10} +$
$94806950871952i^{11} - 47697434364672i^{12} +$
$14497576557000i^{13} - 1231421200400i^{14} - 261341795328i^{15} -$
$1791303477600i^{16} + 1968649212348i^{17} - 2720571167496i^{18} +$
$3481671808680i^{19} - 4184896331616i^{20} + 4972303814322i^{21} -$
$5433064634712i^{22} + 5227387237436i^{23} - 4150070564640i^{24} +$
$2762390058246i^{25} - 1188429298056i^{26} + 558075720384i^{27}\big) +$

$\dfrac{1}{278460}\big(\big(-88 + 1089i - 3519i^2 - 21782i^3 + 279195i^4 - 1489401i^5 + 5165178i^6 -$
$13007448i^7 + 24934716i^8 - 37217590i^9 + 43626726i^{10} - 40042548i^{11} +$
$28291978i^{12} - 14753586i^{13} + 5085720i^{14} - 697272i^{15} - 298044i^{16} +$
$167589i^{17} - 6223i^{18} - 22950i^{19} + 10035i^{20} - 1925i^{21} + 150i^{22}\big)\,\text{Log20}[-i]\big) +$

$\dfrac{1}{278460}\big(\big(-88 + 1617i - 11637i^2 + 42518i^3 - 72555i^4 - 27741i^5 +$
$427074i^6 - 972264i^7 + 983076i^8 + 69530i^9 - 1550094i^{10} + 2023476i^{11} -$
$986986i^{12} - 459306i^{13} + 1040400i^{14} - 697272i^{15} + 298044i^{16} +$
$167589i^{17} + 6223i^{18} - 22950i^{19} - 10035i^{20} - 1925i^{21} - 150i^{22}\big)\,\text{Log20}[i]\big)$

$Q2\left[l=4,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=\dfrac{1}{23685479017200i^{20}}$

$\left(-1629547920+28447250832i-233954412692i^2+1204157838884i^3-\right.$

$4346133251460i^4+11682918743496i^5-24258955671951i^6+$

$39873015184431i^7-52878669564732i^8+57749349893235i^9-$

$53620469219043i^{10}+44895359883520i^{11}-37204213677840i^{12}+$

$33260585204000i^{13}-32412198249000i^{14}+32849436863160i^{15}-$

$33411704547312i^{16}+33392611098054i^{17}-33229833545844i^{18}+$

$32224714985580i^{19}-30091837151376i^{20}+26558628196977i^{21}-$

$21514291119412i^{22}+15468883407054i^{23}-9449127607920i^{24}+$

$\left.4759270472115i^{25}-1710617929020i^{26}+524345869152i^{27}\right)+\dfrac{1}{406980}$

$\left(\left(280-6113i+62563i^2-399546i^3+1786665i^4-5946639i^5+15277254i^6-\right.\right.$

$30984744i^7+50283348i^8-65720810i^9+69191122i^{10}-58265324i^{11}+$

$38572014i^{12}-19362558i^{13}+6783000i^{14}-1248072i^{15}-143412i^{16}+$

$\left.148827i^{17}-21869i^{18}-10730i^{19}+5809i^{20}-1155i^{21}+90i^{22}\right)\text{Log20}[-i]\right)+$

$\dfrac{1}{406980}\left(\left(280-3663i+19793i^2-48426i^3-12825i^4+497211i^5-\right.\right.$

$1815906i^6+3744216i^7-4794612i^8+3058810i^9+1587222i^{10}-6533644i^{11}+$

$8591154i^{12}-7017498i^{13}+3798480i^{14}-1248072i^{15}+143412i^{16}+$

$\left.\left.148827i^{17}+21869i^{18}-10730i^{19}-5809i^{20}-1155i^{21}-90i^{22}\right)\text{Log20}[i]\right)$

$Q2\,[l=5, k_1=0, k_2=0, k_3=1, k_4=1]$

$=$

$\frac{1}{146659312800i^{20}(1+i)^2}\left(-1467648 + 25713324i - 210665728i^2 + 1068749500i^3 -\right.$
$3742921000i^4 + 9530122147i^5 - 18022828096i^6 + 25171379857i^7 -$
$24627379530i^8 + 13357928025i^9 + 3739852116i^{10} - 16706659333i^{11} +$
$19017255166i^{12} - 12427051000i^{13} + 3461604640i^{14} + 3098346056i^{15} -$
$6688242704i^{16} + 9020642904i^{17} - 11804426088i^{18} + 15965201616i^{19} -$
$22837452456i^{20} + 33145392174i^{21} - 46232877084i^{22} +$
$58540567658i^{23} - 63720811616i^{24} + 58820556410i^{25} -$
$\left.42103413660i^{26} + 26235326502i^{27} - 9173817576i^{28} + 3968217792i^{29}\right) +$
$\frac{1}{4476780}\left(\left(448 - 8745i + 80850i^2 - 470470i^3 + 1931160i^4 - 5938317i^5 +\right.\right.$
$14176470i^6 - 26860680i^7 + 40930560i^8 - 50488130i^9 + 50438388i^{10} -$
$40562340i^{11} + 25865840i^{12} - 12684210i^{13} + 4476780i^{14} - 937992i^{15} +$
$\left.65835i^{17} - 14630i^{18} - 2310i^{19} + 1848i^{20} - 385i^{21} + 30i^{22}\right)\text{Log20}[-i]\right) +$
$\frac{1}{4476780}\left(\left(448 - 8745i + 80850i^2 - 470470i^3 + 1931160i^4 - 5938317i^5 +\right.\right.$
$14176470i^6 - 26860680i^7 + 40930560i^8 - 50488130i^9 + 50438388i^{10} -$
$40562340i^{11} + 25865840i^{12} - 12684210i^{13} + 4476780i^{14} - 937992i^{15} +$
$\left.\left.65835i^{17} + 14630i^{18} - 2310i^{19} - 1848i^{20} - 385i^{21} - 30i^{22}\right)\text{Log20}[i]\right)$

$Q2\,[l=6, k_1=0, k_2=0, k_3=1, k_4=1]$

$=\frac{1}{43245694800i^6(1+i)^4}$
$\left(-31620 + 555560i - 4392392i^2 + 20196136i^3 - 56911648i^4 +\right.$
$85680408i^5 + 16321224i^6 - 408172929i^7 + 981765144i^8 - 991287252i^9 -$
$422348908i^{10} + 4040664610i^{11} - 6932409116i^{12} + 10432285076i^{13} -$
$\left.7284854676i^{14} + 7135263021i^{15} - 1820313012i^{16} + 1382863776i^{17}\right)$

$Q2\,[l=7, k_1=0, k_2=0, k_3=1, k_4=1]$

$=\frac{1}{2810970162000i^8(1+i)^6}$
$\left(-614992 + 10830190i - 85414120i^2 + 388294450i^3 - 1062159660i^4 +\right.$
$1463996208i^5 + 725259032i^6 - 7598562080i^7 + 14546372184i^8 - 7434599501i^9 -$
$21840865778i^{10} + 54025436807i^{11} - 33349208740i^{12} + 5813352360i^{13} +$
$120280932480i^{14} + 151486906060i^{15} + 29699470360i^{16} + 630111939095i^{17} -$
$\left.86848475410i^{18} + 506496335055i^{19} - 30481038420i^{20} + 103714783200i^{21}\right)$

$Q2\,[l=0, k_1=0, k_2=1, k_3=0, k_4=1]$

$= \dfrac{1}{73329656400}\left(-1012536i + 51395760i^2 - 67211347i^3 + 584500800i^4 - 270843993i^5 + 1671672288i^6 - 430259256i^7 + 1037589696i^8\right)$

$Q2\,[l=1, k_1=0, k_2=1, k_3=0, k_4=1]$

$= \dfrac{1}{8147739600}\left(-454500i + 8826944i^2 - 32697483i^3 + 126977760i^4 - 172361483i^5 + 300043744i^6 - 143419752i^7 + 115287744i^8\right)$

$Q2\,[l=2, k_1=0, k_2=1, k_3=0, k_4=1]$

$= \dfrac{1}{6990760576800i^{19}}$

$\big(-33693660 + 441080640i - 1477908432i^2 - 6103633536i^3 + 74417483140i^4 - 334108879104i^5 + 934209115455i^6 - 1837386194336i^7 + 2677106860131i^8 - 2965266252384i^9 + 2524501158408i^{10} - 1647181758816i^{11} + 804057453888i^{12} - 271170039584i^{13} + 40820349816i^{14} + 3149742240i^{15} + 55802552i^{16} + 7889385504i^{17} - 10033664316i^{18} + 27818207040i^{19} - 63210098952i^{20} + 144881221056i^{21} - 278017523498i^{22} + 443511951168i^{23} - 481226155410i^{24} + 453580414144i^{25} - 205090245360i^{26} + 98916884352i^{27}\big) +$

$\dfrac{1}{240240}\big(\big(11 - 144i + 930i^2 - 4532i^3 + 20895i^4 - 89172i^5 + 314160i^6 - 864144i^7 + 1839366i^8 - 3045040i^9 + 3938220i^{10} - 3972696i^{11} + 3090022i^{12} - 1802136i^{13} + 740520i^{14} - 181968i^{15} + 10863i^{16} + 3168i^{17} + 4802i^{18} - 4500i^{19} + 1659i^{20} - 308i^{21} + 24i^{22}\big)\,\mathrm{Log20}[-i]\big) +$

$\dfrac{1}{240240}\big(\big(-11 + 144i - 930i^2 + 3564i^3 - 7839i^4 + 6636i^5 + 11728i^6 - 39696i^7 + 36858i^8 + 19472i^9 - 74412i^{10} + 53352i^{11} + 21658i^{12} - 58680i^{13} + 28248i^{14} + 14800i^{15} - 10863i^{16} + 3168i^{17} - 4802i^{18} - 4500i^{19} - 1659i^{20} - 308i^{21} - 24i^{22}\big)\,\mathrm{Log20}[i]\big)$

$Q2\,[l = 3, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{32411708128800 i^{19}}$

$\big(9094837752 - 141388399152i + 1042583461920i^2 - 4864780000080i^3 +$

$16168075400477i^4 - 40812194070648i^5 + 81307215062073i^6 -$

$130703251963152i^7 + 171177785581770i^8 - 182423855198016i^9 +$

$156332408202776i^{10} - 105090993210816i^{11} + 52821031376376i^{12} -$

$17688372886240i^{13} + 2103825207048i^{14} + 1849413184416i^{15} -$

$2259839793588i^{16} + 2816510624928i^{17} - 3444942072780i^{18} +$

$4473263093312i^{19} - 5593473437760i^{20} + 6706015973280i^{21} -$

$7331209556762i^{22} + 7027102417920i^{23} - 5409199139526i^{24} +$

$3467048325312i^{25} - 1331222138064i^{26} + 458614645632i^{27}\big) +$

$\dfrac{1}{1113840}\big(\big(143 - 5544i + 79974i^2 - 651428i^3 + 3515055i^4 - 13632084i^5 +$

$39846912i^6 - 90402192i^7 + 162094014i^8 - 232010560i^9 +$

$265961124i^{10} - 243310392i^{11} + 175523062i^{12} - 97386744i^{13} +$

$39529080i^{14} - 10463568i^{15} + 1206099i^{16} + 106056i^{17} + 69158i^{18} -$

$101700i^{19} + 40635i^{20} - 7700i^{21} + 600i^{22}\big)\,\mathrm{Log20}[-i]\big) +$

$\dfrac{1}{1113840}\big(\big(-143 - 1008i + 21978i^2 - 119252i^3 + 280785i^4 - 88956i^5 -$

$1253376i^6 + 3591216i^7 - 4442814i^8 + 1021360i^9 + 5179356i^{10} - 8385624i^{11} +$

$5293834i^{12} + 641784i^{13} - 3886200i^{14} + 3220752i^{15} - 1206099i^{16} +$

$106056i^{17} - 69158i^{18} - 101700i^{19} - 40635i^{20} - 7700i^{21} - 600i^{22}\big)\,\mathrm{Log20}[i]\big)$

Q2 $[l = 4, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{15790319344800i^{19}}$

$\big(4135131000 - 72471999600i + 597408591780i^2 - 3074846494720i^3 +$
$11059358899589i^4 - 29465289669816i^5 + 60107647908066i^6 -$
$95598467199312i^7 + 119328586525125i^8 - 116188793626944i^9 +$
$85741115450568i^{10} - 43397485502688i^{11} + 7622113609496i^{12} +$
$12993765809760i^{13} - 21021487860480i^{14} + 22930449581664i^{15} -$
$23089480028316i^{16} + 22934443660128i^{17} - 22393662461820i^{18} +$
$21311980913088i^{19} - 19433387000736i^{20} + 16648294332576i^{21} -$
$13036937160942i^{22} + 9056892299520i^{23} - 5297035695714i^{24} +$

$2575146864576i^{25} - 833842438128i^{26} + 223427647872i^{27}\big) + \dfrac{1}{542640}$

$\big(\big(531 - 11304i + 113374i^2 - 712468i^3 + 3146115i^4 - 10373316i^5 + 26480832i^6 -$
$53535312i^7 + 86905734i^8 - 114109440i^9 + 121384692i^{10} - 104168792i^{11} +$
$71290622i^{12} - 38039064i^{13} + 15155160i^{14} - 4108560i^{15} + 572679i^{16} +$
$18696i^{17} + 798i^{18} - 17460i^{19} + 7903i^{20} - 1540i^{21} + 120i^{22}\big) \operatorname{Log20}[-i]\big) +$

$\dfrac{1}{542640} \big(\big(-531 + 7344i - 43934i^2 + 139428i^3 - 191235i^4 - 285684i^5 +$
$2046528i^6 - 5069808i^7 + 7358586i^8 - 5814000i^9 - 453492i^{10} + 8095672i^{11} -$
$12168702i^{12} + 10829544i^{13} - 6472920i^{14} + 2558160i^{15} - 572679i^{16} +$
$18696i^{17} - 798i^{18} - 17460i^{19} - 7903i^{20} - 1540i^{21} - 120i^{22}\big) \operatorname{Log20}[i]\big)$

$Q2\,[l = 5, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{260540269189200i^{19}(1+i)^2}$

$(-3098285190 + 54452017620i - 447779552220i^2 + 2281944204540i^3 -$
$8036690515854i^4 + 20611535256312i^5 - 39366314300544i^6 +$
$55799994964560i^7 - 56067373139820i^8 + 32859881249496i^9 +$
$4184902608152i^{10} - 33735751230104i^{11} + 40731228243860i^{12} -$
$27619791240800i^{13} + 7893894690704i^{14} + 7741507259728i^{15} -$
$17408274195312i^{16} + 24554327704368i^{17} - 32862175311966i^{18} +$
$44522911460804i^{19} - 59956238288834i^{20} + 77838538390664i^{21} -$
$93810867664723i^{22} + 102387762022546i^{23} -$
$96060658413874i^{24} + 80270969598666i^{25} - 50228136251139i^{26} +$
$30820070264016i^{27} - 9442710122472i^{28} + 3686556189888i^{29}) +$

$\dfrac{1}{17907120}\big((2023 - 39600i + 367290i^2 - 2145220i^3 + 8843835i^4 -$
$27334692i^5 + 65659440i^6 - 125349840i^7 + 192821310i^8 -$
$240751280i^9 + 244432188i^{10} - 201048120i^{11} + 132562430i^{12} -$
$68643960i^{13} + 26860680i^{14} - 7333392i^{15} + 1119195i^{16} -$
$14630i^{18} - 13860i^{19} + 7623i^{20} - 1540i^{21} + 120i^{22})\,\text{Log20}[-i]\big) +$

$\dfrac{1}{17907120}\big((-2023 + 39600i - 367290i^2 + 2145220i^3 - 8843835i^4 + 27334692i^5 -$
$65659440i^6 + 125349840i^7 - 192821310i^8 + 240751280i^9 - 244432188i^{10} +$
$201048120i^{11} - 132562430i^{12} + 68643960i^{13} - 26860680i^{14} + 7333392i^{15} -$
$1119195i^{16} + 14630i^{18} - 13860i^{19} - 7623i^{20} - 1540i^{21} - 120i^{22})\,\text{Log20}[i]\big)$

$Q2\,[l = 6, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{43245694800i^5(1+i)^4}$

$(56202 - 994296i + 8195938i^2 - 41592608i^3 + 144097338i^4 - 354040504i^5 +$
$605932262i^6 - 603992304i^7 - 99716517i^8 + 2003546652i^9 -$
$4301152743i^{10} + 7614546520i^{11} - 7273215227i^{12} + 8929383564i^{13} -$
$4160754349i^{14} + 4203031040i^{15} - 851006808i^{16} + 611911872i^{17})$

$Q2\,[l = 7, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{936990054000i^7(1+i)^6}$

$(257754 - 4567220i + 36837504i^2 - 176271436i^3 + 540021116i^4 - 1025012076i^5 +$
$835801260i^6 + 1351544404i^7 - 5504187696i^8 + 8097121404i^9 -$
$2877695101i^{10} - 5696482890i^{11} + 23621193050i^{12} + 19067541190i^{13} +$
$10542936420i^{14} + 154383989970i^{15} - 15909205570i^{16} + 210004095090i^{17} -$
$8752264405i^{18} + 93487130320i^{19} - 2917814040i^{20} + 13258090560i^{21})$

$Q2\left[l=0,k_1=0,k_2=1,k_3=1,k_4=1\right]$

$=\dfrac{1}{73329656400}\left(-37085+1662804i-2924868i^2+\right.$
$\left.46743268i^3-28344105i^4+223370004i^5-25911060i^6+186234048i^7\right)$

$Q2\left[l=1,k_1=0,k_2=1,k_3=1,k_4=1\right]$

$=\dfrac{1}{24443218800}\left(-63762+1051688i-4271421i^2+\right.$
$\left.21515676i^3-27084785i^4+78890812i^5-25911060i^6+62078016i^7\right)$

$Q2\left[l=2,k_1=0,k_2=1,k_3=1,k_4=1\right]$

$=$

$\dfrac{1}{13981521153600i^{18}}\left(-60648588+142125984i+4191931744i^2-39678358720i^3+\right.$
$180026829983i^4-520285593828i^5+1052046728788i^6-$
$1550352479764i^7+1688566040733i^8-1347963643808i^9+$
$757106340736i^{10}-264255925728i^{11}+24033609992i^{12}+66400992i^{13}-$
$5330739808i^{14}+96420896i^{15}+13406198468i^{16}+1091702872i^{18}+$
$11824384i^{19}-2648850204i^{20}+14382146064i^{21}-23419724900i^{22}+$
$\left.50198205200i^{23}-24701877200i^{24}+35508625152i^{25}\right)+$

$\dfrac{1}{240240}\left(\left(-11i+128i^2-474i^3-828i^4+15873i^5-80172i^6+\right.\right.$
$249288i^7-549168i^8+902394i^9-1127984i^{10}+1072292i^{11}-$
$758472i^{12}+375258i^{13}-107304i^{14}+1224i^{15}+8976i^{16}+2193i^{17}-$
$\left.5616i^{18}+3238i^{19}-988i^{20}+165i^{21}-12i^{22}\right)\mathrm{Log20}[-i]\Big)+$

$\dfrac{1}{240240}\left(\left(11i-84i^2+202i^3+76i^4-1233i^5+1904i^6+760i^7-5328i^8+\right.\right.$
$4550i^9+3432i^{10}-8580i^{11}+3432i^{12}+4550i^{13}-3200i^{14}+7928i^{15}+$
$\left.8976i^{16}-2193i^{17}-5616i^{18}-3238i^{19}-988i^{20}-165i^{21}-12i^{22}\right)\mathrm{Log20}[i]\Big)$

$Q2\,[l=3, k_1=0, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{64823416257600 i^{20}} \left(-302630328 - 997332336i + 59523900436i^2 - \right.$
$573147006432i^3 + 3058516791330i^4 - 11002941289340i^5 +$
$28946700120195i^6 - 58106577171060i^7 + 91082257883430i^8 -$
$112671318371700i^9 + 109981251818037i^{10} - 83676392272096i^{11} +$
$48081885517776i^{12} - 19374462796992i^{13} + 4333881109640i^{14} +$
$39985668064i^{15} - 625232478360i^{16} + 34422259872i^{17} + 284293325940i^{18} +$
$56884831588i^{20} - 67914357264i^{21} + 61421333064i^{22} + 26473384912i^{23} -$
$\left. 128637288780i^{24} + 268015182864i^{25} - 160337639280i^{26} + 164630898432i^{27} \right) +$
$\dfrac{1}{371280} \left(\left(-12 + 591i - 9036i^2 + 74842i^3 - 404020i^4 + 1554291i^5 - 4481268i^6 + \right. \right.$
$9980088i^7 - 17477496i^8 + 24280590i^9 - 26779896i^{10} + 23255388i^{11} -$
$15560168i^{12} + 7649966i^{13} - 2454120i^{14} + 305592i^{15} + 100164i^{16} -$
$\left. 18909i^{17} - 34812i^{18} + 25050i^{19} - 8100i^{20} + 1375i^{21} - 100i^{22} \right) \text{Log20}[-i] \right) +$
$\dfrac{1}{1113840} \left(\left(140 - 1245i + 3360i^2 + 4130i^3 - 48300i^4 + 124695i^5 - \right. \right.$
$114240i^6 - 136680i^7 + 507960i^8 - 541450i^9 + 649740i^{11} - 733720i^{12} +$
$239190i^{13} + 248880i^{14} - 280296i^{15} + 300492i^{16} + 56727i^{17} -$
$\left. 104436i^{18} - 75150i^{19} - 24300i^{20} - 4125i^{21} - 300i^{22} \right) \text{Log20}[i] \right)$

$Q2\,[l=4, k_1=0, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{94741916068800 i^{20}}$
$\left(977728752 - 22522067568i + 235569121788i^2 - 1503637431296i^3 + \right.$
$6607042181740i^4 - 21306030717972i^5 + 52367617827525i^6 -$
$100381383864300i^7 + 152012970871740i^8 - 182740337705580i^9 +$
$173803686754611i^{10} - 128951916909408i^{11} + 72185096680288i^{12} -$
$28039756781376i^{13} + 5400344326440i^{14} + 1450072344672i^{15} -$
$1843777657080i^{16} + 840886634016i^{17} - 278388913140i^{18} + 407726738532i^{20} -$
$612357813552i^{21} + 539536804632i^{22} - 188728657104i^{23} - 183151523340i^{24} +$
$\left. 460461466608i^{25} - 301293805680i^{26} + 240614390016i^{27} \right) + \dfrac{1}{1627920}$
$\left(\left(-588 + 12379i - 122764i^2 + 762498i^3 - 3325380i^4 + 10816719i^5 - 27197892i^6 + \right. \right.$
$54039192i^7 - 85946424i^8 + 110068710i^9 - 113440184i^{10} + 93335372i^{11} -$
$60163272i^{12} + 29230854i^{13} - 9806280i^{14} + 1697688i^{15} + 158916i^{16} - 113601$
$i^{17} - 34428i^{18} + 40450i^{19} - 14260i^{20} + 2475i^{21} - 180i^{22}\big) \text{Log20}[-i] \big) +$
$\dfrac{1}{1627920} \left(\left(252 - 3755i + 25200i^2 - 98610i^3 + 238260i^4 - 316863i^5 + \right. \right.$
$969000i^7 - 2209320i^8 + 2645370i^9 - 1478048i^{10} - 755820i^{11} +$
$2519400i^{12} - 2781030i^{13} + 1860480i^{14} - 767448i^{15} + 158916i^{16} +$
$\left. 113601i^{17} - 34428i^{18} - 40450i^{19} - 14260i^{20} - 2475i^{21} - 180i^{22} \right) \text{Log20}[i] \right)$

$\mathrm{Q2}\,[l = 5, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{1042161076756800\,i^{20}(1+i)^2}$

$\big(1582989408 - 24818137344i + 176119891948i^2 - 733930036840i^3 +$

$1911450721180i^4 - 2830694762896i^5 + 460027134853i^6 + 8782242768134i^7 -$

$23711688880605i^8 + 34964764669140i^9 - 31175356456545i^{10} +$

$11285224547870i^{11} + 11931927287665i^{12} - 23529449732800i^{13} +$

$19874195103400i^{14} - 8746114769392i^{15} - 976825920488i^{16} +$

$6396301495584i^{17} - 9349446729084i^{18} + 11649009540168i^{19} -$

$13822146724868i^{20} + 14457993280592i^{21} - 11559841083932i^{22} +$

$5354934960584i^{23} + 2134674746512i^{24} - 4784021809336i^{25} + 6491955660036$

$i^{26} + 555649576944i^{27} + 1242788748432i^{28} + 2646758290176i^{29}\big) +$

$\dfrac{1}{1193808}\,\big(\big(-48 + 935i - 8624i^2 + 50050i^3 - 204820i^4 + 627627i^5 -$

$1492260i^6 + 2813976i^7 - 4263600i^8 + 5222910i^9 - 5173168i^{10} +$

$4115020i^{11} - 2586584i^{12} + 1243550i^{13} - 426360i^{14} + 85272i^{15} -$

$4389i^{17} + 770i^{19} - 308i^{20} + 55i^{21} - 4i^{22}\big)\,\mathrm{Log20}[-i]\big) +$

$\dfrac{1}{17907120}\,\big(\big(176 - 3465i + 32340i^2 - 190190i^3 + 790020i^4 - 2462229i^5 +$

$5969040i^6 - 11511720i^7 + 17907120i^8 - 22632610i^9 + 23279256i^{10} -$

$19399380i^{11} + 12932920i^{12} - 6715170i^{13} + 2558160i^{14} - 596904i^{15} +$

$65835i^{17} - 11550i^{19} - 4620i^{20} - 825i^{21} - 60i^{22}\big)\,\mathrm{Log20}[i]\big)$

$\mathrm{Q2}\,[l = 6, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{43245694800\,i^6(1+i)^4}$

$\big(4845 - 103632i + 998138i^2 - 5741784i^3 + 21891036i^4 - 57374456i^5 +$

$101128972i^6 - 100763824i^7 - 14216253i^8 + 256021464i^9 -$

$455964489i^{10} + 574003916i^{11} - 183141663i^{12} + 263280264i^{13} +$

$418764427i^{14} + 160852708i^{15} + 240669884i^{16} + 109830336i^{17}\big)$

$\mathrm{Q2}\,[l = 7, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{2810970162000\,i^8(1+i)^6}$

$\big(94962 - 1927664i + 17685219i^2 - 95889010i^3 + 333553379i^4 - 733618272i^5 +$

$807644058i^6 + 559561324i^7 - 3831777831i^8 + 6482382750i^9 -$

$3332389615i^{10} - 6425822100i^{11} + 17935849460i^{12} - 6215482280i^{13} +$

$10230857700i^{14} + 54693769080i^{15} + 24647340155i^{16} + 77063110230i^{17} +$

$60316498925i^{18} + 40531881100i^{19} + 27934971540i^{20} + 7138971840i^{21}\big)$

$Q2 [l = 0, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$$= \frac{1}{36664828200} \left(-19287i + 1511640i^2 - 1604869i^3 + 14108640i^4 - 2825091i^5 + 28821936i^6 - 6209352i^7 + 13302432i^8\right)$$

$Q2 [l = 1, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$$= \frac{1}{12221609400} \left(-11310i + 506464i^2 - 1473843i^3 + 7054320i^4 - 7792603i^5 + 15519504i^6 - 6209352i^7 + 4434144i^8\right)$$

$Q2 [l = 2, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$$= \frac{1}{3495380288400i^{17}}$$
$$\left(94342248 - 1235025792i + 7440633200i^2 - 27295107840i^3 + 67953218333i^4 - 121076331376i^5 + 158541178125i^6 - 154043859376i^7 + 110595558920i^8 - 57640716624i^9 + 21362011768i^{10} - 6287669360i^{11} + 4024024392i^{12} + 110893680i^{13} + 5004168312i^{14} + 268336848i^{15} + 241428356i^{16} + 832678496i^{17} - 1642982484i^{18} + 3315261664i^{19} - 5698069806i^{20} + 8588936928i^{21} - 8450168870i^{22} + 7820351968i^{23} - 2959791120i^{24} + 1268165184i^{25}\right) + \frac{1}{120120}$$
$$\left(\left(11i^2 - 188i^3 + 1506i^4 - 7500i^5 + 25959i^6 - 66096i^7 + 127704i^8 - 190128i^9 + 218790i^{10} - 192712i^{11} + 126412i^{12} - 58344i^{13} + 17238i^{14} - 4080i^{15} + 3672i^{16} - 4080i^{17} + 2703i^{18} - 1116i^{19} + 290i^{20} - 44i^{21} + 3i^{22}\right) \text{Log20}[-i]\right) +$$
$$\frac{1}{120120} \left(\left(-11i^2 + 100i^3 - 354i^4 + 500i^5 + 281i^6 - 1968i^7 + 2216i^8 + 848i^9 - 4134i^{10} + 2808i^{11} + 1716i^{12} - 3432i^{13} + 1066i^{14} + 496i^{15} - 3672i^{16} - 4080i^{17} - 2703i^{18} - 1116i^{19} - 290i^{20} - 44i^{21} - 3i^{22}\right) \text{Log20}[i]\right)$$

$Q2\left[l=3, k_1=1, k_2=1, k_3=1, k_4=1\right]$

$= \dfrac{1}{16205854064400 i^{19}}$

$\big(828251424 - 12614906304i + 90434624280i^2 - 406349863920i^3 +$

$1286155084214i^4 - 3055388331996i^5 + 5663275490301i^6 - 8386523352504i^7 +$

$10035824586750i^8 - 9692499658512i^9 + 7430458535672i^{10} -$

$4346871263472i^{11} + 1779476985192i^{12} - 394438456720i^{13} -$

$20265128664i^{14} + 65887525872i^{15} + 31153964244i^{16} + 95796254736i^{17} -$

$98480654220i^{18} + 137715509984i^{19} - 158410450770i^{20} +$

$171953081040i^{21} - 168714956774i^{22} + 146101013760i^{23} -$

$100957724322i^{24} + 59776695264i^{25} - 19211735088i^{26} + 5879674944i^{27}\big) +$

$\dfrac{1}{556920}\big(\left(26 - 708i + 8493i^2 - 61196i^3 + 300810i^4 - 1079388i^5 + 2943159i^6 -\right.$

$6249744i^7 + 10482948i^8 - 13973320i^9 + 14775618i^{10} - 12257544i^{11} +$

$7780084i^{12} - 3590808i^{13} + 1081710i^{14} - 172176i^{15} + 46818i^{16} -$

$73908i^{17} + 59681i^{18} - 26700i^{19} + 7170i^{20} - 1100i^{21} + 75i^{22}\big) \text{Log20}[-i]\big) +$

$\dfrac{1}{556920}\big(\left(-26 + 84i + 1011i^2 - 8204i^3 + 24630i^4 - 26292i^5 - 44727i^6 +\right.$

$193392i^7 - 266628i^8 + 76840i^9 + 287742i^{10} - 461448i^{11} + 253708i^{12} +$

$90168i^{13} - 233070i^{14} + 146064i^{15} - 46818i^{16} - 73908i^{17} -$

$59681i^{18} - 26700i^{19} - 7170i^{20} - 1100i^{21} - 75i^{22}\big) \text{Log20}[i]\big)$

$Q2\left[l = 4, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1\right]$

$$= \frac{1}{23685479017200i^{19}}$$

$\big(836215380 - 14494399920i + 117987569700i^2 - 598544906960i^3 +$

$2116755760119i^4 - 5528192706036i^5 + 11009870596956i^6 - 17003002888872$

$i^7 + 20453116516065i^8 - 18981224422224i^9 + 13116630350808i^{10} -$

$5993458133328i^{11} + 698381411296i^{12} + 1823522727600i^{13} -$

$2476669348080i^{14} + 2466117263664i^{15} - 2373233834556i^{16} +$

$2340165651408i^{17} - 2186876739060i^{18} + 1980050910048i^{19} -$

$1683763347906i^{20} + 1323724682736i^{21} - 938540258262i^{22} + 585911664000i^{23} -$

$305236226754i^{24} + 133197251616i^{25} - 36101172528i^{26} + 8593371072i^{27}\big) +$

$$\frac{1}{813960}\big(\big(126 - 2604i + 25379i^2 - 155028i^3 + 665190i^4 - 2128836i^5 + 5264577i^6 -$$

$10279152i^7 + 16042764i^8 - 20116440i^9 + 20230782i^{10} - 16157752i^{11} +$

$10027212i^{12} - 4627944i^{13} + 1443810i^{14} - 232560i^{15} + 5814i^{16} -$

$23484i^{17} + 29583i^{18} - 15060i^{19} + 4238i^{20} - 660i^{21} + 45i^{22}\big) \text{Log}20[-i]\big) +$

$$\frac{1}{813960}\big(\big(-126 + 1764i - 10819i^2 + 36468i^3 - 63270i^4 - 2964i^5 +$$

$316863i^6 - 883728i^7 + 1321716i^8 - 1046520i^9 - 75582i^{10} + 1377272i^{11} -$

$1965132i^{12} + 1604664i^{13} - 823650i^{14} + 232560i^{15} - 5814i^{16} -$

$23484i^{17} - 29583i^{18} - 15060i^{19} - 4238i^{20} - 660i^{21} - 45i^{22}\big) \text{Log}20[i]\big)$

Q2 $[l = 5, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{130270134594600 i^{19}(1+i)^2}$

$(-208288080 + 3626663040i - 29501862390i^2 + 148430662380i^3 - 514711425228i^4 + 1294761672204i^5 - 2410863049518i^6 + 3295421661840i^7 - 3112415683440i^8 + 1533257939472i^9 + 697881716084i^{10} - 2246436464888i^{11} + 2348764229240i^{12} - 1361440671800i^{13} + 179902161428i^{14} + 632089330576i^{15} - 1084924353744i^{16} + 1441925473296i^{17} - 1898809374462i^{18} + 2547180208028i^{19} - 3287889079388i^{20} + 3958809136628i^{21} - 4269138654451i^{22} + 4035601339462i^{23} - 3215821742518i^{24} + 2245986647982i^{25} - 1169921895153i^{26} + 609578488992i^{27} - 148153022424i^{28} + 47263540896i^{29}) + $

$\dfrac{1}{8953560} \big(\big(136 - 2640i + 24255i^2 - 140140i^3 + 570570i^4 - 1738044i^5 + 4103715i^6 - 7674480i^7 + 11511720i^8 - 13927760i^9 + 13579566i^{10} - 10581480i^{11} + 6466460i^{12} - 2984520i^{13} + 959310i^{14} - 170544i^{15} + 7315i^{18} - 4620i^{19} + 1386i^{20} - 220i^{21} + 15i^{22} \big) \mathrm{Log20}[-i] \big) + $

$\dfrac{1}{8953560} \big(\big(-136 + 2640i - 24255i^2 + 140140i^3 - 570570i^4 + 1738044i^5 - 4103715i^6 + 7674480i^7 - 11511720i^8 + 13927760i^9 - 13579566i^{10} + 10581480i^{11} - 6466460i^{12} + 2984520i^{13} - 959310i^{14} + 170544i^{15} - 7315i^{18} - 4620i^{19} - 1386i^{20} - 220i^{21} - 15i^{22} \big) \mathrm{Log20}[i] \big)$

Q2 $[l = 6, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{21622847400 i^5(1+i)^4}$

$(5814 - 101592i + 821406i^2 - 4048176i^3 + 13419766i^4 - 30800328i^5 + 46870544i^6 - 34290168i^7 - 37300899i^8 + 174210924i^9 - 308744571i^{10} + 414074520i^{11} - 350308929i^{12} + 310516468i^{13} - 129045663i^{14} + 93308240i^{15} - 16224936i^{16} + 7845024i^{17})$

Q2 $[l = 7, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{1405485081000 i^7(1+i)^6}$

$(81396 - 1426368i + 11327610i^2 - 52986212i^3 + 156499314i^4 - 276064224i^5 + 160852062i^6 + 539326020i^7 - 1661300025i^8 + 1994035854i^9 - 49815576i^{10} - 3059499150i^{11} + 5382999955i^{12} + 1514020080i^{13} - 4482407325i^{14} + 22094976450i^{15} - 11339922990i^{16} + 21668037570i^{17} - 4105905605i^{18} + 6368733120i^{19} - 510818040i^{20} + 509926560i^{21})$

Case 3: $i_1 = i_2 = i$, $i_3 = i_4 = i + 1$

$Q3\,[l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{97772875200}$

$\left(17497207 + 213996674i + 1180193754i^2 + 3849919976i^3 + 8165874340i^4 +\right.$

$\left.11597731632i^5 + 10834338612i^6 + 6124204032i^7 + 1616245488i^8\right)$

$Q3\,[l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{5431826400} \left(681183 + 8425842i + 47140058i^2 + 156679012i^3 +\right.$

$\left.340812500i^4 + 501530764i^5 + 493770746i^6 + 302369344i^7 + 89791416i^8\right)$

$Q3\,[l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{16295479200i^6}$

$\left(22221108 - 5157936i - 63281820i^2 - 37508408i^3 + 7740341i^4 + 10548216i^5 +\right.$

$4907812i^6 + 19264112i^7 + 109000806i^8 + 364295012i^9 + 805580962i^{10} +$

$\left.1208175648i^{11} + 1230064750i^{12} + 793515392i^{13} + 269374248i^{14}\right) +$

$\dfrac{1}{10010} \left(\left(-273i^{14} - 224i^{15} + 845i^{16} + 1278i^{17} + 389i^{18} -\right.\right.$

$\left.\left.230i^{19} - 177i^{20} - 44i^{21} - 4i^{22}\right) \text{Log20}[i]\right)$

$Q3\,[l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{97772875200i^6} \left(80582040 + 87085152i - 1532496042i^2 -\right.$

$1832464788i^3 + 90380598i^4 + 257629680i^5 + 177379745i^6 +$

$29942110i^7 + 600370650i^8 + 1691791480i^9 + 4027685360i^{10} +$

$5912056872i^{11} + 6311883828i^{12} + 4079536512i^{13} + 1616245488i^{14}\big) +$

$\dfrac{1}{185640} \left(\left(-3060i^{14} - 6528i^{15} + 54723i^{16} + 130842i^{17} + 69638i^{18} -\right.\right.$

$\left.\left.13400i^{19} - 16740i^{20} - 4400i^{21} - 400i^{22}\right) \text{Log20}[i]\right)$

$Q3\,[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$=$

$\dfrac{1}{32590958400i^4(1+i)^2} \left(-52378326 - 404972568i - 721062342i^2 - 363447084i^3 +\right.$

$59572149i^4 + 98552496i^5 + 215017813i^6 + 810965470i^7 +$

$2236347630i^8 + 4396123072i^9 + 6272640088i^{10} + 6476362344i^{11} +$

$\left.4698188748i^{12} + 2210157216i^{13} + 538748496i^{14}\right) +$

$\dfrac{\left(2907i^{16} + 19722i^{17} + 21318i^{18} - 120i^{19} - 3092i^{20} - 880i^{21} - 80i^{22}\right) \text{Log20}[i]}{90440}$

Q3 $[l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$=$

$\frac{1}{537750813600 i^2 (1+i)^4} \left(-263603340 - 804683880 i - 792783589 i^2 + 223734990 i^3 + \right.$

$3724483651 i^4 + 17466562548 i^5 + 57258228672 i^6 + 137080260108 i^7 +$

$245998634266 i^8 + 334736471388 i^9 + 344547508448 i^{10} +$

$\left. 263409644652 i^{11} + 143302431294 i^{12} + 50497737312 i^{13} + 8889350184 i^{14} \right) +$

$\frac{\left(7315 i^{18} + 770 i^{19} - 693 i^{20} - 220 i^{21} - 20 i^{22} \right) \text{Log20}[i]}{746130}$

Q3 $[l = 6, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{1}{28830463200 (1+i)^6}$

$\left(1331897 + 24719620 i + 215784435 i^2 + 1175671610 i^3 + 4472587933 i^4 + \right.$

$12587691168 i^5 + 27077215635 i^6 + 45321215490 i^7 + 59464765800 i^8 +$

$61052582392 i^9 + 48469381292 i^{10} + 28997038860 i^{11} +$

$\left. 12441569170 i^{12} + 3459536720 i^{13} + 476585208 i^{14} \right)$

Q3 $[l = 7, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{1}{1249320072000 (1+i)^8}$

$\left(50902047 + 1047075594 i + 10198615802 i^2 + 62484512936 i^3 + 269765250066 i^4 + \right.$

$871091019084 i^5 + 2178675364080 i^6 + 4310767069200 i^7 + 6829235283945 i^8 +$

$8706128907630 i^9 + 8919537468930 i^{10} + 7284506731080 i^{11} + 4663585794480 i^{12} +$

$\left. 2271881875320 i^{13} + 798726706300 i^{14} + 182508540160 i^{15} + 20652025680 i^{16} \right)$

Q3 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \frac{1}{293318625600}$

$\left(-9420775 - 119057934 i - 679211340 i^2 - 2294538776 i^3 - 5046032445 i^4 - \right.$

$\left. 7439442210 i^5 - 7222313592 i^6 - 4247010720 i^7 - 1167288408 i^8 \right)$

Q3 $[l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \frac{1}{32590958400} \left(-723750 - 9257340 i - 53619475 i^2 - 184738204 i^3 - \right.$

$\left. 417136545 i^4 - 638172570 i^5 - 654288180 i^6 - 417987840 i^7 - 129698712 i^8 \right)$

$Q3\,[l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{97772875200 i^6}$

$(-44442216 + 1199520i + 133880712i^2 + 96589136i^3 - 11963868i^4 - 25937856i^5 -$
$10445400i^6 - 21502824i^7 - 123068319i^8 - 426138556i^9 - 979058847i^{10} -$
$1527198150i^{11} - 1621015552i^{12} - 1092256800i^{13} - 389096136i^{14}) +$

$\dfrac{1}{120120}\left((1092i^{14} + 1120i^{15} - 3324i^{16} - 5832i^{17} - 2199i^{18} +\right.$
$\left. 948i^{19} + 885i^{20} + 242i^{21} + 24i^{22}\right)\text{Log20}[i])$

$Q3\,[l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{293318625600 i^6}\left(-80582040 - 130062240i + 1566990810i^2 +\right.$
$2253917820i^3 + 34008282i^4 - 350713440i^5 - 186849625i^6 -$
$16664010i^7 - 345621870i^8 - 975811600i^9 - 2442230265i^{10} -$
$3710910330i^{11} - 4145672700i^{12} - 2791650240i^{13} - 1167288408i^{14}) +$

$\dfrac{1}{556920}\left((3060i^{14} + 8160i^{15} - 54315i^{16} - 148230i^{17} - 91198i^{18} +\right.$
$\left. 12000i^{19} + 20925i^{20} + 6050i^{21} + 600i^{22}\right)\text{Log20}[i])$

$Q3\,[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{97772875200 i^4 (1 + i)^2}\left(52378326 + 450161712i + 866575710i^2 +\right.$
$476143668i^3 - 57894291i^4 - 104205780i^5 - 132466085i^6 -$
$464379450i^7 - 1317390285i^8 - 2677212020i^9 - 3950065059i^{10} -$
$4222772838i^{11} - 3172273440i^{12} - 1547035632i^{13} - 389096136i^{14}) +$

$\dfrac{1}{271320}\left((-2907i^{16} - 22230i^{17} - 27018i^{18} - 720i^{19} + 3865i^{20} + 1210i^{21} + 120i^{22})\right.$
$\text{Log20}[i])$

$Q3\,[l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{3226504881600 i^2 (1 + i)^4}$

$(659008350 + 2025583560i + 2064676120i^2 + 157990408i^3 -$
$4169995593i^4 - 19726718920i^5 - 66246497305i^6 - 163096848750i^7 -$
$301203444773i^8 - 421960158092i^9 - 447271870155i^{10} - 352133438910i^{11} -$
$197172953340i^{12} - 71396199072i^{13} - 12840172488i^{14}) +$

$\dfrac{\left(-7315i^{18} - 924i^{19} + 693i^{20} + 242i^{21} + 24i^{22}\right)\text{Log20}[i]}{1790712}$

$Q3\left[l=6,k_1=0,k_2=0,k_3=0,k_4=1\right]$

$=\dfrac{1}{57660926400(1+i)^6}$

$\left(-460250-8742640i-78140925i^2-436092602i^3-1700026192i^4-\right.$

$4904613480i^5-10818415010i^6-18572554740i^7-24997993578i^8-$

$26328268728i^9-21436499675i^{10}-13144518630i^{11}-$

$\left.5773521640i^{12}-1639491152i^{13}-229466952i^{14}\right)$

$Q3\left[l=7,k_1=0,k_2=0,k_3=0,k_4=1\right]$

$=\dfrac{1}{3747960216000(1+i)^8}$

$\left(-26337675-553262046i-5504793412i^2-34462814712i^3-152078259111i^4-\right.$

$502065768006i^5-1284111794760i^6-2598681253440i^7-4211167549095i^8-$

$5491471692630i^9-5754166913220i^{10}-4804868165880i^{11}-3143399861715i^{12}-$

$\left.1563386129310i^{13}-560322667300i^{14}-130198871040i^{15}-14915351880i^{16}\right)$

$Q3\left[l=0,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=\dfrac{1}{293318625600}\left(1706341+22245438i+131054917i^2+457731002i^3+\right.$

$\left.1042021560i^4+1592484126i^5+1604989584i^6+981426456i^7+281013876i^8\right)$

$Q3\left[l=1,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=\dfrac{1}{48886437600}\left(196587+2593842i+15514282i^2+55260807i^3+\right.$

$\left.129162285i^4+204830241i^5+218019186i^6+144849996i^7+46835646i^8\right)$

$Q3\left[l=2,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=\dfrac{1}{48886437600i^6}$

$\left(7407036+1319472i-23343040i^2-19893496i^3+994833i^4+5169906i^5+\right.$

$2086917i^6+2153340i^7+11867867i^8+42480851i^9+101028567i^{10}+$

$\left.163345109i^{11}+179994980i^{12}+126128916i^{13}+46835646i^{14}\right)+$

$\dfrac{1}{60060}\left(\left(-182i^{14}-224i^{15}+540i^{16}+1092i^{17}+489i^{18}-\right.\right.$

$\left.\left.153i^{19}-181i^{20}-55i^{21}-6i^{22}\right)\operatorname{Log}20[i]\right)$

$Q3\left[l=3,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=\dfrac{1}{293318625600i^6}$

$\left(26860680+57679776i-532037814i^2-893675244i^3-69111504i^4+\right.$

$147096180i^5+70820665i^6+7743450i^7+66739035i^8+194430850i^9+$

$504047580i^{10}+793556166i^{11}+920553876i^{12}+644447016i^{13}+281013876i^{14}\right)+$

$\dfrac{1}{556920}\left(\left(-1020i^{14}-3264i^{15}+17901i^{16}+55206i^{17}+38281i^{18}-\right.\right.$

$\left.\left.2850i^{19}-8520i^{20}-2750i^{21}-300i^{22}\right)\text{Log}20[i]\right)$

$Q3\left[l=4,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=\dfrac{1}{293318625600i^4(1+i)}$

$\left(-52378326-442972530i-574251678i^2-29723694i^3+77572677i^4+\right.$

$41797707i^5+52246645i^6+223989685i^7+575731230i^8+1099828338i^9+$

$1447109502i^{10}+1361987640i^{11}+813134412i^{12}+281013876i^{13}\right)+$

$\dfrac{\left(2907i^{16}+24738i^{17}+33003i^{18}+2130i^{19}-4688i^{20}-1650i^{21}-180i^{22}\right)\text{Log}20[i]}{813960}$

$Q3\left[l=5,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=$

$\dfrac{1}{1613252440800i^2(1+i)^3}\left(-131801670-277477200i-150982637i^2+53699901i^3+\right.$

$357870108i^4+1577772941i^5+5039069475i^6+11664710904i^7+$

$19992131005i^8+25529047368i^9+23996821761i^{10}+$

$16006833480i^{11}+6945596262i^{12}+1545576318i^{13}\right)+$

$\dfrac{\left(7315i^{18}+1155i^{19}-693i^{20}-275i^{21}-30i^{22}\right)\text{Log}20[i]}{4476780}$

$Q3\left[l=6,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=$

$\dfrac{1}{28830463200(1+i)^5}\left(41657+766687i+6616432i^2+35503687i^3+132394925i^4+\right.$

$363044903i^5+754930403i^6+1208749843i^7+1495351348i^8+1417750360i^9+$

$1006953317i^{10}+511323212i^{11}+168326282i^{12}+27621022i^{13}\right)$

$Q3\left[l=7,k_1=0,k_2=0,k_3=1,k_4=1\right]$

$=\dfrac{1}{11243880648000(1+i)^7}$

$\left(14302575+292003275i+2815877708i^2+17030333738i^3+72319163604i^4+\right.$

$228679091770i^5+556999012300i^6+1065801412320i^7+1618168009205i^8+$

$1953451492685i^9+1864441390680i^{10}+1386032484850i^{11}+$

$780170484550i^{12}+315769347840i^{13}+82885798740i^{14}+10772198580i^{15}\right)$

$Q3\left[l=0, k_1=0, k_2=1, k_3=0, k_4=0\right]$

$=\dfrac{1}{293318625600}$

$\left(15169700 + 183432132i + 998284338i^2 + 3205851736i^3 + 6673639515i^4 + \right.$

$\left. 9266724270i^5 + 8423365836i^6 + 4606176384i^7 + 1167288408i^8\right)$

$Q3\left[l=1, k_1=0, k_2=1, k_3=0, k_4=0\right]$

$=$

$\dfrac{1}{32590958400}\left(1189344 + 14554632i + 80413557i^2 + 263319924i^3 + 562581355i^4 + \right.$

$\left. 809764382i^5 + 775287856i^6 + 457895136i^7 + 129698712i^8\right)$

$Q3\left[l=2, k_1=0, k_2=1, k_3=0, k_4=0\right]$

$=$

$\dfrac{1}{97772875200 i^5}\left(-82047168 - 123636240i - 4900896i^2 + 71780982i^3 + 42217056i^4 + \right.$

$13227872i^5 + 33956664i^6 + 186708729i^7 + 615952964i^8 + 1338116097i^9 +$

$\left. 1965391578i^{10} + 1946662860i^{11} + 1211978688i^{12} + 389096136i^{13}\right) +$

$\dfrac{1}{120120}\left(\left(2016i^{15} + 5160i^{16} + 3312i^{17} - 1639i^{18} - 2892i^{19} - \right.\right.$

$\left.\left. 1347i^{20} - 286i^{21} - 24i^{22}\right)\mathrm{Log20}[i]\right)$

$Q3\left[l=3, k_1=0, k_2=1, k_3=0, k_4=0\right]$

$=\dfrac{1}{293318625600 i^5}$

$\left(-386793792 - 1639632456i - 900340056i^2 + 919123128i^3 + 614053440i^4 + \right.$

$216337380i^5 + 48669060i^6 + 499741440i^7 + 1451851280i^8 + 3343507995i^9 +$

$\left. 4848954318i^{10} + 5010559464i^{11} + 3150815904i^{12} + 1167288408i^{13}\right) +$

$\dfrac{1}{556920}\left(\left(14688i^{15} + 77724i^{16} + 99684i^{17} + 948i^{18} - 60000i^{19} - \right.\right.$

$\left.\left. 32475i^{20} - 7150i^{21} - 600i^{22}\right)\mathrm{Log20}[i]\right)$

$Q3\left[l=4, k_1=0, k_2=1, k_3=0, k_4=0\right]$

$=\dfrac{1}{97772875200 i^4(1+i)^2}\left(-69837768 - 366053688i - 473489016i^2 - \right.$

$23183160i^3 + 262293486i^4 + 157508260i^5 + 198354160i^6 +$

$694376100i^7 + 1888512025i^8 + 3657447100i^9 + 5127649377i^{10} +$

$\left. 5182621602i^{11} + 3662661084i^{12} + 1666757520i^{13} + 389096136i^{14}\right) +$

$\dfrac{\left(3876i^{16} + 16644i^{17} + 10488i^{18} - 8720i^{19} - 6175i^{20} - 1430i^{21} - 120i^{22}\right)\mathrm{Log20}[i]}{271320}$

Q3 $[l = 5, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{3226504881600i^2(1+i)^4}$

$\left(-395405010 - 1082161080i - 747038370i^2 + 1026310116i^3 + \right.$

$6802364673i^4 + 30139536280i^5 + 97496060155i^6 + 230674591290i^7 +$

$408477229699i^8 + 547359865492i^9 + 553462427265i^{10} + 414423142650i^{11} +$

$\left. 220024783440i^{12} + 75347021376i^{13} + 12840172488i^{14}\right) +$

$\dfrac{\left(4389i^{18} - 924i^{19} - 1155i^{20} - 286i^{21} - 24i^{22}\right) \mathrm{Log20}[i]}{1790712}$

Q3 $[l = 6, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{172982779200(1+i)^6}$

$\left(2349676 + 43330824i + 375590691i^2 + 2030493574i^3 + 7658242626i^4 + \right.$

$21347584344i^5 + 45430890576i^6 + 75132751464i^7 + 97256051586i^8 +$

$98342577704i^9 + 76741982091i^{10} + 45028751814i^{11} +$

$\left. 18903268796i^{12} + 5130289104i^{13} + 688400856i^{14}\right)$

Q3 $[l = 7, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{3747960216000(1+i)^8}$

$\left(44927736 + 918900956i + 8894551850i^2 + 54125400888i^3 + 231944189127i^4 + \right.$

$742878177606i^5 + 1841414349360i^6 + 3607638290880i^7 + 5653359437430i^8 +$

$7120847132520i^9 + 7199049718410i^{10} + 5793794795880i^{11} + 3649812325545i^{12} +$

$\left. 1746797887290i^{13} + 602361446760i^{14} + 134788210080i^{15} + 14915351880i^{16}\right)$

Q3 $[l = 0, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{195545750400} \left(-1773317 - 22123348i - 124325481i^2 - 412617634i^3 - \right.$

$\left. 888449405i^4 - 1277108712i^5 - 1202835204i^6 - 682245768i^7 - 179582832i^8\right)$

Q3 $[l = 1, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{21727305600} \left(-137682 - 1740072i - 9938229i^2 - 33675026i^3 - \right.$

$\left. 74523225i^4 - 111218856i^5 - 110508636i^6 - 67786072i^7 - 19953648i^8\right)$

Q3 $[l = 2, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\frac{1}{65181916800 i^5} \left(18232704 + 32738328 i + 6618304 i^2 - 17066042 i^3 - 11764620 i^4 - 3464412 i^5 - 4232816 i^6 - 22943859 i^7 - 78375374 i^8 - 176503255 i^9 - 269059608 i^{10} - 276887228 i^{11} - 179301176 i^{12} - 59860944 i^{13}\right) +$

$\frac{\left(-448 i^{15} - 1276 i^{16} - 1008 i^{17} + 249 i^{18} + 730 i^{19} + 381 i^{20} + 88 i^{21} + 8 i^{22}\right) \text{Log20}[i]}{80080}$

Q3 $[l = 3, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \frac{1}{195545750400 i^5}$

$\left(85954176 + 418531806 i + 330448272 i^2 - 198683562 i^3 - 176784300 i^4 - 56451815 i^5 - 8847740 i^6 - 61248165 i^7 - 183967850 i^8 - 439513225 i^9 - 661951944 i^{10} - 711087084 i^{11} - 465732408 i^{12} - 179582832 i^{13}\right) +$

$\frac{1}{371280} \left(\left(-3264 i^{15} - 19329 i^{16} - 29268 i^{17} - 5627 i^{18} + 14650 i^{19} + 9165 i^{20} + 2200 i^{21} + 200 i^{22}\right) \text{Log20}[i]\right)$

Q3 $[l = 4, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \frac{1}{65181916800 i^4 (1 + i)^2}$

$\left(17459442 + 102810708 i + 154750596 i^2 + 33969936 i^3 - 65153907 i^4 - 40790386 i^5 - 28950608 i^6 - 86947520 i^7 - 242388670 i^8 - 484634012 i^9 - 701268587 i^{10} - 732258024 i^{11} - 534186444 i^{12} - 250908984 i^{13} - 59860944 i^{14}\right) +$

$\frac{\left(-969 i^{16} - 4788 i^{17} - 4047 i^{18} + 1970 i^{19} + 1737 i^{20} + 440 i^{21} + 40 i^{22}\right) \text{Log20}[i]}{180880}$

Q3 $[l = 5, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\frac{1}{2151003254400 i^2 (1 + i)^4} \left(131801670 + 374594220 i + 306536828 i^2 - 105212432 i^3 - 880848241 i^4 - 3733282526 i^5 - 12306525029 i^6 - 29902729956 i^7 - 54420851485 i^8 - 74961770202 i^9 - 77909820131 i^{10} - 59934323064 i^{11} - 32648218548 i^{12} - 11436936456 i^{13} - 1975411152 i^{14}\right) +$

$\frac{\left(-7315 i^{18} + 770 i^{19} + 1617 i^{20} + 440 i^{21} + 40 i^{22}\right) \text{Log20}[i]}{5969040}$

Q3 $[l = 6, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \frac{1}{115321852800 (1 + i)^6}$

$\left(-266658 - 5029876 i - 44611149 i^2 - 246857040 i^3 - 953286334 i^4 - 2721510612 i^5 - 5932926084 i^6 - 10051996176 i^7 - 13330125180 i^8 - 13805554776 i^9 - 11028179633 i^{10} - 6617057496 i^{11} - 2835173844 i^{12} - 782422280 i^{13} - 105907824 i^{14}\right)$

$Q3\,[l = 7, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{2498640144000(1 + i)^8}$

$\big(-5090841 - 106271852i - 1050182365i^2 - 6525925666i^3 - 28564299543i^4 - 93463231632i^5 - 236712695010i^6 - 473888118780i^7 - 758822925645i^8 - 976547479380i^9 - 1008419790675i^{10} - 828539057670i^{11} - 532406598195i^{12} - 259575535320i^{13} - 90989351940i^{14} - 20619635240i^{15} - 2294669520i^{16}\big)$

$Q3\,[l = 0, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{293318625600}\big(-2715076 - 33933224i - 191095883i^2 - 635804322i^3 - 1373049915i^4 - 1980384516i^5 - 1871883192i^6 - 1065179064i^7 - 281013876i^8\big)$

$Q3\,[l = 1, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{97772875200}\big(-627864 - 7945600i - 45453331i^2 - 154323834i^3 - 342391875i^4 - 512694252i^5 - 511709520i^6 - 315808728i^7 - 93671292i^8\big)$

$Q3\,[l = 2, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$=$

$\dfrac{1}{97772875200i^5}\big(27349056 + 44630712i + 3895584i^2 - 27545546i^3 - 17838660i^4 - 5226494i^5 - 6379184i^6 - 34845635i^7 - 119045802i^8 - 268798035i^9 - 410744508i^{10} - 424584792i^{11} - 276557768i^{12} - 93671292i^{13}\big) +$

$\dfrac{1}{120120}\big(\big(-672i^{15} - 1804i^{16} - 1248i^{17} + 577i^{18} + 1150i^{19} + 577i^{20} + 132i^{21} + 12i^{22}\big)\,\text{Log20}[i]\big)$

$Q3\,[l = 3, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{293318625600i^5}$

$\big(128931264 + 562660560i + 331497936i^2 - 357663306i^3 - 267844500i^4 - 88264190i^5 - 9771960i^6 - 96175035i^7 - 275089650i^8 - 670062075i^9 - 1003044276i^{10} - 1087760640i^{11} - 711920424i^{12} - 281013876i^{13}\big) +$

$\dfrac{1}{556920}\big(\big(-4896i^{15} - 26520i^{16} - 35064i^{17} + 379i^{18} + 24450i^{19} + 13995i^{20} + 3300i^{21} + 300i^{22}\big)\,\text{Log20}[i]\big)$

$\mathrm{Q3}\left[l=4, k_1=0, k_2=1, k_3=1, k_4=0\right]$

$= \dfrac{1}{293318625600 i^4 (1+i)^2}$

$\left(69837768 + 370161792i + 472245774i^2 - 26882856i^3 - 338164008i^4 - 187527704i^5 - 131036637i^6 - 393708480i^7 - 1099576130i^8 - 2200482828i^9 - 3190547583i^{10} - 3339184716i^{11} - 2446496316i^{12} - 1156195296i^{13} - 281013876i^{14}\right) + \dfrac{1}{813960}$

$\left(\left(-3876i^{16} - 16872i^{17} - 10203i^{18} + 11230i^{19} + 8053i^{20} + 1980i^{21} + 180i^{22}\right)\right.$
$\left.\mathrm{Log20}[i]\right)$

$\mathrm{Q3}\left[l=5, k_1=0, k_2=1, k_3=1, k_4=0\right]$

$=$

$\dfrac{1}{3226504881600 i^2 (1+i)^4}\left(131801670 + 346846500i + 205202894i^2 - 287676376i^3 - 1352414973i^4 - 5630269258i^5 - 18566272807i^6 - 45148734048i^7 - 82252265865i^8 - 113454350526i^9 - 118143634323i^{10} - 91142448012i^{11} - 49870220664i^{12} - 17605171848i^{13} - 3091152636i^{14}\right) +$

$\dfrac{\left(-7315i^{18} + 2310i^{19} + 2541i^{20} + 660i^{21} + 60i^{22}\right)\mathrm{Log20}[i]}{8953560}$

$\mathrm{Q3}\left[l=6, k_1=0, k_2=1, k_3=1, k_4=0\right]$

$= \dfrac{1}{172982779200 (1+i)^6}$

$\left(-401212 - 7569832i - 67158543i^2 - 371754940i^3 - 1436215792i^4 - 4102356648i^5 - 8949033798i^6 - 15174775872i^7 - 20145598800i^8 - 20895093728i^9 - 16726341497i^{10} - 10066974972i^{11} - 4334167748i^{12} - 1205875280i^{13} - 165726132i^{14}\right)$

$\mathrm{Q3}\left[l=7, k_1=0, k_2=1, k_3=1, k_4=0\right]$

$= \dfrac{1}{11243880648000 (1+i)^8}$

$\left(-22965600 - 479499448i - 4739462913i^2 - 29458944078i^3 - 128982140781i^4 - 422185926084i^5 - 1069732934490i^6 - 2142720727500i^7 - 3433423773270i^8 - 4422450757560i^9 - 4572106738155i^{10} - 3762490606530i^{11} - 2423115721695i^{12} - 1185266054100i^{13} - 417574580880i^{14} - 95412429960i^{15} - 10772198580i^{16}\right)$

$\mathrm{Q3}\left[l=0, k_1=0, k_2=1, k_3=1, k_4=1\right]$

$=$

$\dfrac{1}{586637251200}\left(960869 + 12369513i + 71810265i^2 + 246516799i^3 + 549795495i^4 + 819790929i^5 + 802076184i^6 + 473201460i^7 + 129698712i^8\right)$

$Q3\left[l=1, k_1=0, k_2=1, k_3=1, k_4=1\right]$

$= \dfrac{1}{65181916800} \left(74322 + 968986i + 5715605i^2 + 20026811i^3 + \right.$
$\left. 45894975i^4 + 71045541i^5 + 73364928i^6 + 46880220i^7 + 14410968i^8\right)$

$Q3\left[l=2, k_1=0, k_2=1, k_3=1, k_4=1\right]$
$=$

$\dfrac{1}{195545750400i^5} \left(-18232704 - 35017416i - 8614648i^2 + 19160442i^3 + 14649390i^4 + \right.$
$4438896i^5 + 2638692i^6 + 13168947i^7 + 46470989i^8 + 108376665i^9 +$
$\left. 171276507i^{10} + 183177176i^{11} + 123547500i^{12} + 43232904i^{13}\right) +$
$\dfrac{1}{240240} \left(\left(448i^{15} + 1332i^{16} + 1116i^{17} - 249i^{18} - 855i^{19} - 483i^{20} - 121i^{21} - 12i^{22}\right)\right.$
$\left. \mathrm{Log20}[i]\right)$

$Q3\left[l=3, k_1=0, k_2=1, k_3=1, k_4=1\right]$
$= \dfrac{1}{586637251200i^5}$
$\left(-85954176 - 429276078i - 355400430i^2 + 224915922i^3 + 223527150i^4 + \right.$
$72601235i^5 + 8970555i^6 + 35780085i^7 + 108187475i^8 + 270024675i^9 +$
$\left. 419722749i^{10} + 469817712i^{11} + 319363020i^{12} + 129698712i^{13}\right) +$
$\dfrac{1}{1113840} \left(\left(3264i^{15} + 19737i^{16} + 30645i^{17} + 5627i^{18} - 17475i^{19} - \right.\right.$
$\left.\left. 11655i^{20} - 3025i^{21} - 300i^{22}\right) \mathrm{Log20}[i]\right)$

$Q3\left[l=4, k_1=0, k_2=1, k_3=1, k_4=1\right]$
$= \dfrac{1}{195545750400i^4(1+i)}$
$\left(-17459442 - 86378292i - 69345276i^2 + 44108064i^3 + 37921611i^4 + \right.$
$12751466i^5 + 10402260i^6 + 40989080i^7 + 104487610i^8 + 195219984i^9 +$
$\left. 251635107i^{10} + 229742148i^{11} + 132594084i^{12} + 43232904i^{13}\right) +$
$\dfrac{\left(969i^{16} + 4845i^{17} + 4047i^{18} - 2455i^{19} - 2219i^{20} - 605i^{21} - 60i^{22}\right) \mathrm{Log20}[i]}{542640}$

$Q3\left[l=5, k_1=0, k_2=1, k_3=1, k_4=1\right]$
$=$

$\dfrac{1}{6453009763200i^2(1+i)^3} \left(-131801670 - 235855620i - 44567276i^2 + 153898056i^3 + \right.$
$435269289i^4 + 1759217498i^5 + 5529126405i^6 + 12613882512i^7 +$
$21259718557i^8 + 26622772374i^9 + 24455789523i^{10} +$
$\left. 15873169620i^{11} + 6664902156i^{12} + 1426685832i^{13}\right) +$
$\dfrac{\left(7315i^{18} - 1155i^{19} - 2079i^{20} - 605i^{21} - 60i^{22}\right) \mathrm{Log20}[i]}{17907120}$

$Q3\,[l = 6, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{115321852800(1+i)^5}\left(47726 + 871588i + 7457495i^2 + 39638268i^3 + 146257050i^4 + \right.$
$396338484i^5 + 813279172i^6 + 1282796480i^7 + 1560256612i^8 + 1451102200i^9 +$
$\left. 1008413771i^{10} + 499615108i^{11} + 160020660i^{12} + 25496328i^{13}\right)$

$Q3\,[l = 7, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{7495920432000(1+i)^7}$

$\left(2732625 + 55403188i + 530234433i^2 + 3180350770i^3 + 13382993983i^4 + \right.$
$41896609380i^5 + 100928201570i^6 + 190781773100i^7 + 285774638325i^8 +$
$339875003380i^9 + 319083173695i^{10} + 232940905350i^{11} +$
$\left. 128538801995i^{12} + 50916137300i^{13} + 13060627740i^{14} + 1657261320i^{15}\right)$

$Q3\,[l = 0, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{293318625600}\left(4387656 + 52456040i + 281706139i^2 + 890513002i^3 + \right.$
$\left. 1819079190i^4 + 2468750826i^5 + 2182711260i^6 + 1154358072i^7 + 281013876i^8\right)$

$Q3\,[l = 1, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{48886437600}\left(520100 + 6298144i + 34370609i^2 + 110910667i^3 + \right.$
$\left. 232787240i^4 + 327769855i^5 + 305126472i^6 + 173671932i^7 + 46835646i^8\right)$

$Q3\,[l = 2, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$=$

$\dfrac{1}{48886437600i^4}\left(15383844 + 36551088i + 32142852i^2 + 13309506i^3 + 3187737i^4 + \right.$
$5043556i^5 + 26728520i^6 + 87093079i^7 + 185944032i^8 +$
$\left. 267614031i^9 + 257922606i^{10} + 154950852i^{11} + 46835646i^{12}\right) +$
$\dfrac{\left(-378i^{16} - 1296i^{17} - 1734i^{18} - 1157i^{19} - 412i^{20} - 77i^{21} - 6i^{22}\right)\mathrm{Log20}[i]}{60060}$

$Q3\,[l = 3, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{293318625600i^4}$

$\left(145047672 + 717604272i + 913832766i^2 + 410436180i^3 + 99228990i^4 + \right.$
$22656480i^5 + 138320325i^6 + 417677810i^7 + 928693590i^8 + 1333750410i^9 +$
$\left. 1333041672i^{10} + 817378632i^{11} + 281013876i^{12}\right) + \dfrac{1}{556920}$
$\left(\left(-5508i^{16} - 33048i^{17} - 63369i^{18} - 52050i^{19} - 20070i^{20} - 3850i^{21} - 300i^{22}\right)\right.$
$\left.\mathrm{Log20}[i]\right)$

Q3 $[l = 4, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{293318625600i^3(1+i)^2}$

$(73945872 + 437386950i + 827530704i^2 + 666441958i^3 + 263483584i^4 +$
$191836827i^5 + 597673780i^6 + 1602440455i^7 + 3060050808i^8 + 4218675906i^9 +$
$4178228250i^{10} + 2878395120i^{11} + 1267079904i^{12} + 281013876i^{13}) +$

$\dfrac{(-4104i^{17} - 20387i^{18} - 26590i^{19} - 11618i^{20} - 2310i^{21} - 180i^{22})\,\text{Log}20[i]}{813960}$

Q3 $[l = 5, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$=$

$\dfrac{1}{1613252440800i(1+i)^4}(62432370 + 224743428i + 407446962i^2 + 1098018519i^3 +$
$4366060049i^4 + 13903129061i^5 + 32527070169i^6 + 56881349756i^7 +$
$75128674313i^8 + 74699470824i^9 + 54832136271i^{10} +$
$28419750612i^{11} + 9442296468i^{12} + 1545576318i^{13}) +$

$\dfrac{(-3465i^{19} - 1848i^{20} - 385i^{21} - 30i^{22})\,\text{Log}20[i]}{4476780}$

Q3 $[l = 6, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{86491389600(1+i)^6}$

$(346500 + 6351212i + 54686929i^2 + 293486333i^3 + 1097990811i^4 + 3033309420i^5 +$
$6391048893i^6 + 10451645556i^7 + 13359765027i^8 + 13317736644i^9 + 10224891040$
$i^{10} + 5887963637i^{11} + 2417812624i^{12} + 638834568i^{13} + 82863066i^{14})$

Q3 $[l = 7, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{11243880648000(1+i)^8}$

$(39779768 + 809217920i + 7787003145i^2 + 47084019174i^3 + 200369459250i^4 +$
$636883249014i^5 + 1565565502470i^6 + 3039227846700i^7 + 4714811891280i^8 +$
$5872869443100i^9 + 5864541395295i^{10} + 4655431322730i^{11} + 2887949394450i^{12} +$
$1358295413130i^{13} + 459054253800i^{14} + 100287042600i^{15} + 10772198580i^{16})$

Q3 $[l = 0, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200}(-1534624 - 18933915i - 105030432i^2 - 343275059i^3 -$
$725686950i^4 - 1020170439i^5 - 935104380i^6 - 513108756i^7 - 129698712i^8)$

Q3 $[l = 1, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{65181916800}(-119680 - 1496814i - 8445248i^2 - 28206311i^3 -$
$61346250i^4 - 89617395i^5 - 86668652i^6 - 51314364i^7 - 14410968i^8)$

Q3 $[l = 2, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\frac{1}{195545750400i^4}\left(-20511792 - 53130168i - 50928192i^2 - 22788990i^3 - 5394508i^4 - 3860556i^5 - 19549824i^6 - 65935729i^7 - 145985550i^8 - 218131533i^9 - 218656788i^{10} - 136849932i^{11} - 43232904i^{12}\right) +$

$\frac{\left(504i^{16} + 1836i^{17} + 2624i^{18} + 1875i^{19} + 714i^{20} + 143i^{21} + 12i^{22}\right)\text{Log20}[i]}{240240}$

Q3 $[l = 3, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \frac{1}{586637251200i^4}$

$\left(-96698448 - 514664766i - 723841272i^2 - 355197150i^3 - 86535540i^4 - 12154065i^5 - 50936160i^6 - 156612775i^7 - 363189750i^8 - 540357435i^9 - 562961868i^{10} - 359270316i^{11} - 129698712i^{12}\right) + \frac{1}{1113840}$

$\left(\left(3672i^{16} + 23409i^{17} + 48048i^{18} + 42375i^{19} + 17430i^{20} + 3575i^{21} + 300i^{22}\right)\right.$

$\left.\text{Log20}[i]\right)$

Q3 $[l = 4, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\frac{1}{195545750400i^3(1+i)^2}\left(-17459442 - 109657548i - 219399180i^2 - 185578120i^3 - 73375757i^4 - 31129826i^5 - 74251540i^6 - 203376140i^7 - 400771634i^8 - 570393528i^9 - 583697841i^{10} - 415557588i^{11} - 189129420i^{12} - 43232904i^{13}\right) +$

$\frac{\left(969i^{17} + 5168i^{18} + 7275i^{19} + 3374i^{20} + 715i^{21} + 60i^{22}\right)\text{Log20}[i]}{542640}$

Q3 $[l = 5, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \frac{1}{6453009763200i(1+i)^4}$

$\left(-104053950 - 369972564i - 570350196i^2 - 960747840i^3 - 3236907947i^4 - 10405383158i^5 - 24983507967i^6 - 44891916608i^7 - 60943807991i^8 - 62291325162i^9 - 46999254753i^{10} - 25026095556i^{11} - 8530568244i^{12} - 1426685832i^{13}\right) +$

$\frac{\left(5775i^{19} + 3234i^{20} + 715i^{21} + 60i^{22}\right)\text{Log20}[i]}{17907120}$

Q3 $[l = 6, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \frac{1}{345965558400(1+i)^6}$

$\left(-233240 - 4371486i - 38501628i^2 - 211422311i^3 - 809587404i^4 - 2289835530i^5 - 4940626044i^6 - 8275362372i^7 - 10834833744i^8 - 11062280836i^9 - 8696597160i^{10} - 5124988731i^{11} - 2151527548i^{12} - 580086036i^{13} - 76488984i^{14}\right)$

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$Q3\,[l = 7, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{7495920432000(1+i)^8}$

$(-4454408 - 92454103i - 907978552i^2 - 5604390591i^3 - 24351852726i^4 - 79047749373i^5 - 198471021900i^6 - 393577570830i^7 - 623719056780i^8 - 793618267035i^9 - 809399603760i^{10} - 656031783345i^{11} - 415313197650i^{12} - 199190894985i^{13} - 68566846980i^{14} - 15227815620i^{15} - 1657261320i^{16})$

$Q3\,[l = 0, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{97772875200}\left(45136 + 573755i + 3282201i^2 + 11073389i^3 + 24189565i^4 + 35178291i^5 + 33396585i^6 + 19004028i^7 + 4988412i^8\right)$

$Q3\,[l = 1, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{10863652800}\left(3520 + 45358i + 263914i^2 + 909881i^3 + 2044875i^4 + 3090255i^5 + 3095309i^6 + 1900532i^7 + 554268i^8\right)$

$Q3\,[l = 2, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{32590958400i^4}\left(1139544 + 3195864i + 3313912i^2 + 1604610i^3 + 398062i^4 + 141652i^5 + 610932i^6 + 2126959i^7 + 4866185i^8 + 7521777i^9 + 7809171i^{10} + 5068516i^{11} + 1662804i^{12}\right) +$

$\dfrac{\left(-28i^{16} - 108i^{17} - 164i^{18} - 125i^{19} - 51i^{20} - 11i^{21} - i^{22}\right)\mathrm{Log20}[i]}{40040}$

$Q3\,[l = 3, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{97772875200i^4}\left(5372136 + 30607038i + 46879602i^2 + 25121250i^3 + 6417810i^4 + 767305i^5 + 1591755i^6 + 5052025i^7 + 12106325i^8 + 18633015i^9 + 20105781i^{10} + 13306308i^{11} + 4988412i^{12}\right) +$

$\dfrac{\left(-204i^{16} - 1377i^{17} - 3003i^{18} - 2825i^{19} - 1245i^{20} - 275i^{21} - 25i^{22}\right)\mathrm{Log20}[i]}{185640}$

$Q3\,[l = 4, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{32590958400i^3(1+i)}\left(1027026 + 5765760i + 8492484i^2 + 4160884i^3 + 1042769i^4 + 540540i^5 + 1877920i^6 + 4776090i^7 + 8714236i^8 + 11034516i^9 + 9766551i^{10} + 5465160i^{11} + 1662804i^{12}\right) +$

$\dfrac{\left(-57i^{17} - 323i^{18} - 485i^{19} - 241i^{20} - 55i^{21} - 5i^{22}\right)\mathrm{Log20}[i]}{90440}$

Q3 $[l = 5, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{1075501627200 i(1+i)^3}$

$\left(6936930 + 17818476 i + 18085808 i^2 + 23730876 i^3 + 82401137 i^4 + \right.$

$254298990 i^5 + 572187693 i^6 + 949353944 i^7 + 1167179101 i^8 + 1049075082 i^9 +$

$\left. 663043095 i^{10} + 269203704 i^{11} + 54872532 i^{12}\right) +$

$\dfrac{\left(-385 i^{19} - 231 i^{20} - 55 i^{21} - 5 i^{22}\right) \text{Log20}[i]}{2984520}$

Q3 $[l = 6, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{57660926400 (1+i)^5}$

$\left(6860 + 124362 i + 1055496 i^2 + 5560289 i^3 + 20313900 i^4 + 54443070 i^5 + \right.$

$110341488 i^6 + 171633084 i^7 + 205483656 i^8 + 187691500 i^9 +$

$\left. 127743840 i^{10} + 61757277 i^{11} + 19196536 i^{12} + 2941884 i^{13}\right)$

Q3 $[l = 7, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{1249320072000 (1+i)^7}$

$\left(131012 + 2638867 i + 25075746 i^2 + 149239887 i^3 + 622691234 i^4 + \right.$

$1931316335 i^5 + 4605129780 i^6 + 8607334390 i^7 + 12733449520 i^8 +$

$14936577315 i^9 + 13809547070 i^{10} + 9910253225 i^{11} +$

$\left. 5363890950 i^{12} + 2078002735 i^{13} + 519138520 i^{14} + 63740820 i^{15}\right)$

Case 4: $i_1 = i_2 = i_3 = i$, $i_4 = i + 1$

Q4 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{195545750400}$

$\left(13766151 + 195126738 i + 1268224968 i^2 + 4983556088 i^3 + 13121297020 i^4 + \right.$

$\left. 24169915656 i^5 + 30664989504 i^6 + 24408660384 i^7 + 9338307264 i^8\right)$

Q4 $[l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{10863652800} \left(472383 + 6720438 i + 43879486 i^2 + 173435276 i^3 + \right.$

$\left. 460180000 i^4 + 856818984 i^5 + 1131187344 i^6 + 1035155568 i^7 + 518794848 i^8\right)$

Q4 $[l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{1}{32590958400i^8} \left(496271412 - 195341832i - 1349792248i^2 - 610613248i^3 + 193629513i^4 + 107808778i^5 - 4102140i^6 - 29628648i^7 + 5025906i^8 + 419952i^9 + 110382342i^{10} + 345419860i^{11} + 1014339054i^{12} + 1789546692i^{13} + 2512867648i^{14} + 2142823344i^{15} + 1556384544i^{16}\right) +$

$\frac{1}{20020} \left(\left(-6097i^{12} - 4018i^{13} + 19128i^{14} + 24928i^{15} + 5502i^{16} - 3834i^{17} - 1329i^{18} + 402i^{19} + 354i^{20} + 88i^{21} + 8i^{22}\right) \text{Log20}[i]\right)$

Q4 $[l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$=$

$\frac{1}{195545750400i^8} \left(2444321880 + 2315673360i - 46750149600i^2 - 49251595008i^3 + 7117417692i^4 + 2860506264i^5 + 2709173544i^6 - 3330890640i^7 + 2620372725i^8 - 2913441210i^9 + 3531263040i^{10} - 1557638120i^{11} + 7900222040i^{12} + 4972904352i^{13} + 14812490592i^{14} + 7081079904i^{15} + 9338307264i^{16}\right) +$

$\frac{1}{371280} \left(\left(-92820i^{12} - 185640i^{13} + 1683000i^{14} + 3738912i^{15} + 1693047i^{16} - 392526i^{17} - 217176i^{18} + 18600i^{19} + 33480i^{20} + 8800i^{21} + 800i^{22}\right) \text{Log20}[i]\right)$

Q4 $[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{1}{65181916800i^6(1+i)^2}$

$\left(-2095133040 - 15952416480i - 27055090062i^2 - 12084768696i^3 + 2166646482i^4 + 1141944804i^5 - 76772793i^6 - 116598912i^7 + 117581539i^8 + 695282650i^9 + 2241284580i^{10} + 5141237416i^{11} + 8826522580i^{12} + 11142886680i^{13} + 10505324352i^{14} + 6660611424i^{15} + 3112769088i^{16}\right) +$

$\frac{1}{180880} \left(\left(116280i^{14} + 775200i^{15} + 766479i^{16} - 59166i^{17} - 64296i^{18} - 2040i^{19} + 6184i^{20} + 1760i^{21} + 160i^{22}\right) \text{Log20}[i]\right)$

Q4 $[l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{1}{537750813600i^4(1+i)^4}$

$\left(-6721885170 - 19811872080i - 19101992910i^2 - 5193448260i^3 + 1251283554i^4 + 571688562i^5 + 1257536469i^6 + 6981914582i^7 + 26041189068i^8 + 71085694042i^9 + 147005404007i^{10} + 233963068482i^{11} + 286876942132i^{12} + 268234841028i^{13} + 185593911096i^{14} + 90427118760i^{15} + 25680344976i^{16}\right) +$

$\frac{\left(373065i^{16} - 21945i^{18} - 2310i^{19} + 1386i^{20} + 440i^{21} + 40i^{22}\right) \text{Log20}[i]}{1492260}$

$Q4\left[l=6, k_1=0, k_2=0, k_3=0, k_4=0\right]$

$= \dfrac{1}{19220308800(1+i)^6}$

$\left(257229 + 5215128i + 49961157i^2 + 300291466i^3 + 1267660373i^4 + \right.$

$3985359096i^5 + 9649873307i^6 + 18343204858i^7 + 27622192884i^8 +$

$32967560692i^9 + 30927863054i^{10} + 22378701828i^{11} +$

$\left. 12063269632i^{12} + 4500072176i^{13} + 917867808i^{14}\right)$

$Q4\left[l=7, k_1=0, k_2=0, k_3=0, k_4=0\right]$

$=$

$\dfrac{1}{2498640144000(1+i)^8}\left(29192499 + 650282802i + 6883842524i^2 + 46021317368i^3 + \right.$

$217759955598i^4 + 774413949612i^5 + 2144709070140i^6 + 4727393663040i^7 +$

$8400101931645i^8 + 12104353247910i^9 + 14143572839880i^{10} +$

$13318143548040i^{11} + 9973049181080i^{12} + 5803896006720i^{13} +$

$\left. 2520312617120i^{14} + 749852355360i^{15} + 119322815040i^{16}\right)$

$Q4\left[l=0, k_1=0, k_2=0, k_3=0, k_4=1\right]$

$= \dfrac{1}{586637251200}$

$\left(-7646555 - 111428253i - 744951876i^2 - 3012475508i^3 - 8165116050i^4 - \right.$

$\left. 15485835240i^5 - 20287697184i^6 - 16791483168i^7 - 6744333024i^8\right)$

$Q4\left[l=1, k_1=0, k_2=0, k_3=0, k_4=1\right]$

$= \dfrac{1}{32590958400}\left(-270180 - 3953151i - 26560772i^2 - 108083906i^3 - \right.$

$\left. 295349775i^4 - 566352570i^5 - 769572048i^6 - 723401136i^7 - 374685168i^8\right)$

$Q4\left[l=2, k_1=0, k_2=0, k_3=0, k_4=1\right]$

$= \dfrac{1}{97772875200i^8}$

$\left(-496271412 + 31817268i + 1521923368i^2 + 936179160i^3 - 204696975i^4 - \right.$

$148508087i^5 + 2490516i^6 + 29461068i^7 + 3603505i^8 - 1780992i^9 -$

$65400528i^{10} - 222819478i^{11} - 659456199i^{12} - 1213356720i^{13} -$

$\left. 1738685744i^{14} - 1541826288i^{15} - 1124055504i^{16}\right) +$

$\dfrac{1}{120120}\left(\left(12194i^{12} + 12054i^{13} - 38256i^{14} - 62320i^{15} - 19125i^{16} + \right.\right.$

$\left.\left. 8946i^{17} + 3760i^{18} - 774i^{19} - 885i^{20} - 242i^{21} - 24i^{22}\right) \mathrm{Log20}[i]\right)$

$Q4\,[l=3,k_1=0,k_2=0,k_3=0,k_4=1]$

$=$

$\frac{1}{586637251200i^8}\left(-2444321880-4759995240i+49323120000i^2+71150808960i^3-\right.$
$5666209164i^4-6063506988i^5-1440114984i^6+1864086840i^7-911273725i^8+$
$1294391745i^9-1705184460i^{10}+500661980i^{11}-4744569990i^{12}-$
$\left.3871758060i^{13}-10027149984i^{14}-5480695008i^{15}-6744333024i^{16}\right)+\frac{1}{1113840}$
$\left(\left(92820i^{12}+278460i^{13}-1683000i^{14}-4673640i^{15}-2622879i^{16}+457947i^{17}+\right.\right.$
$\left.\left.295076i^{18}-11700i^{19}-41850i^{20}-12100i^{21}-1200i^{22}\right)\mathrm{Log20}[i]\right)$

$Q4\,[l=4,k_1=0,k_2=0,k_3=0,k_4=1]$

$=\frac{1}{195545750400i^6(1+i)}$

$\left(2095133040+17349171840i+19997799822i^2-1454076624i^3-\right.$
$1254347094i^4-328696368i^5+407449545i^6-270731580i^7+253473535i^8-$
$733086880i^9-699624050i^{10}-2829860190i^{11}-3245047848i^{12}-$
$\left.4782611904i^{13}-2818255104i^{14}-2248111008i^{15}\right)+$
$\frac{1}{542640}\left(\left(-116280i^{14}-969000i^{15}-1154079i^{16}+69027i^{17}+\right.\right.$
$\left.\left.85956i^{18}+4860i^{19}-7730i^{20}-2420i^{21}-240i^{22}\right)\mathrm{Log20}[i]\right)$

$Q4\,[l=5,k_1=0,k_2=0,k_3=0,k_4=1]$

$=\frac{1}{3226504881600i^4(1+i)^3}$
$\left(20165655510+39269960730i+18167819670i^2-2199006810i^3-1169817925i^4-\right.$
$184843497i^5-1321386465i^6-7540101185i^7-26514586725i^8-$
$68802219255i^9-133095043543i^{10}-196092522615i^{11}-216920512710i^{12}-$
$\left.177740104080i^{13}-99952427520i^{14}-37093831632i^{15}\right)+$
$\frac{\left(-223839i^{16}+11704i^{18}+1386i^{19}-693i^{20}-242i^{21}-24i^{22}\right)\mathrm{Log20}[i]}{1790712}$

$Q4\,[l=6,k_1=0,k_2=0,k_3=0,k_4=1]$

$=\frac{1}{57660926400(1+i)^5}$
$\left(-153790-3029543i-28115821i^2-163121108i^3-661787065i^4-1988673380i^5-\right.$
$4570634497i^6-8171790704i^7-11430840817i^8-12450827015i^9-$
$\left.10382158600i^{10}-6408195968i^{11}-2741479296i^{12}-662904528i^{13}\right)$

$Q4\left[l=7, k_1=0, k_2=0, k_3=0, k_4=1\right]$

$= \dfrac{1}{7495920432000(1+i)^7}$

$\left(-17497935 - 379745082i - 3907035526i^2 - 25314605330i^3 - 115696700098i^4 - 395801222660i^5 - 1049197266400i^6 - 2199703025540i^7 - 3687821813665i^8 - 4960593656150i^9 - 5332722723790i^{10} - 4526892260030i^{11} - 2967354711060i^{12} - 1443735219040i^{13} - 480571906560i^{14} - 86177588640i^{15}\right)$

$Q4\left[l=0, k_1=0, k_2=0, k_3=1, k_4=0\right]$

$= \dfrac{1}{586637251200}$

$\left(10827098 + 149655543i + 942463728i^2 + 3554674708i^3 + 8850572970i^4 + 15024761784i^5 + 17080694784i^6 + 11933676864i^7 + 3950822304i^8\right)$

$Q4\left[l=1, k_1=0, k_2=0, k_3=1, k_4=0\right]$

$= \dfrac{1}{32590958400}\left(382338 + 5330863i + 33955271i^2 + 130071466i^3 + 331191945i^4 + 582279054i^5 + 704536644i^6 + 552283488i^7 + 219490128i^8\right)$

$Q4\left[l=2, k_1=0, k_2=0, k_3=1, k_4=0\right]$

$= \dfrac{1}{97772875200i^7}\left(-155547756 - 17453016i + 440500872i^2 + 417369288i^3 + 75665233i^4 - 63713664i^5 - 43838676i^6 - 7679364i^7 + 8388522i^8 + 76269435i^9 + 279823582i^{10} + 734419863i^{11} + 1295636448i^{12} + 1629488488i^{13} + 1324754784i^{14} + 658470384i^{15}\right) + $

$\dfrac{1}{120120}\left(\left(3822i^{13} + 4452i^{14} - 10384i^{15} - 21636i^{16} - 12636i^{17} - 381i^{18} + 2718i^{19} + 1347i^{20} + 286i^{21} + 24i^{22}\right)\text{Log20}[i]\right)$

$Q4\left[l=3, k_1=0, k_2=0, k_3=1, k_4=0\right]$

$= \dfrac{1}{586637251200i^7}$

$\left(-564074280 - 856714320i + 11225313792i^2 + 17700497892i^3 + 4717150284i^4 - 1019411316i^5 - 1763241480i^6 + 145906430i^7 - 473629035i^8 + 863278260i^9 + 769602020i^{10} + 3989929890i^{11} + 5542399332i^{12} + 8366508792i^{13} + 5955954624i^{14} + 3950822304i^{15}\right) + $

$\dfrac{1}{1113840}\left(\left(21420i^{13} + 55080i^{14} - 392088i^{15} - 1120878i^{16} - 885321i^{17} - 149356i^{18} + 107700i^{19} + 64950i^{20} + 14300i^{21} + 1200i^{22}\right)\text{Log20}[i]\right)$

Q4 $[l = 4, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400 i^5 (1+i)^2}$

$\left(419026608 + 3434915484 i + 6981416442 i^2 + 5037904872 i^3 + \right.$
$831945114 i^4 - 461669502 i^5 - 246610325 i^6 + 67961980 i^7 + 550987155 i^8 +$
$1732106890 i^9 + 3883404688 i^{10} + 6405950814 i^{11} + 7763394072 i^{12} +$
$\left.6775992192 i^{13} + 3955008384 i^{14} + 1316940768 i^{15}\right) +$

$\dfrac{1}{542640} \left(\left(-23256 i^{15} - 168606 i^{16} - 227601 i^{17} - 63156 i^{18} + \right.\right.$
$\left.\left.14020 i^{19} + 12350 i^{20} + 2860 i^{21} + 240 i^{22}\right) \text{Log20}[i]\right)$

Q4 $[l = 5, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{3226504881600 i^3 (1+i)^4}$

$\left(2372430060 + 7915037130 i + 9559089540 i^2 + 4722408692 i^3 + \right.$
$679345220 i^4 + 1723478037 i^5 + 11079083470 i^6 + 40978445245 i^7 +$
$109532651778 i^8 + 220894116905 i^9 + 340747481558 i^{10} + 401761551675 i^{11} +$
$\left.356435097810 i^{12} + 228892090812 i^{13} + 97757526240 i^{14} + 21729522672 i^{15}\right) +$

$\dfrac{\left(-26334 i^{17} - 10241 i^{18} + 462 i^{19} + 1155 i^{20} + 286 i^{21} + 24 i^{22}\right) \text{Log20}[i]}{1790712}$

Q4 $[l = 6, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{57660926400 (1+i)^6}$

$\left(215014 + 4314513 i + 40858107 i^2 + 242394391 i^3 + 1008180768 i^4 + 3116079621 i^5 + \right.$
$7397571512 i^6 + 13739719323 i^7 + 20126164674 i^8 + 23226569872 i^9 + 20888804079$
$i^{10} + 14290644648 i^{11} + 7099806152 i^{12} + 2327832576 i^{13} + \left.388328688 i^{14}\right)$

Q4 $[l = 7, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$=$

$\dfrac{1}{7495920432000 (1+i)^8} \left(24436098 + 539328659 i + 5651260712 i^2 + 37354148664 i^3 + \right.$
$174517581006 i^4 + 611821887018 i^5 + 1667196141000 i^6 + 3607554326580 i^7 +$
$6275315210250 i^8 + 8821587004725 i^9 + 10011462291600 i^{10} +$
$9101848383660 i^{11} + 6523149844950 i^{12} + 3582213518780 i^{13} +$
$\left.1433362254920 i^{14} + 378123024960 i^{15} + 50482729440 i^{16}\right)$

Q4 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200} \left(-1997934 - 28403531 i - 184108877 i^2 - 715296786 i^3 - \right.$
$1836262410 i^4 - 3218098476 i^5 - 3786204708 i^6 - 2749115016 i^7 - \left.951123888 i^8\right)$

$Q4\,[l=1,k_1=0,k_2=0,k_3=1,k_4=1]$

$= \dfrac{1}{97772875200}\left(-217050 - 3112286i - 20400422i^2 - 80469711i^3 - 211100925i^4 - 382553220i^5 - 477224748i^6 - 385743396i^7 - 158520648i^8\right)$

$Q4\,[l=2,k_1=0,k_2=0,k_3=1,k_4=1]$

$= \dfrac{1}{97772875200\,i^7}$
$\left(51849252 + 21201516i - 156949576i^2 - 175311472i^3 - 37884861i^4 + 23978493i^5 + 18084906i^6 + 4280724i^7 - 1491661i^8 - 15371479i^9 - 58813179i^{10} - 158316493i^{11} - 288637702i^{12} - 373299498i^{13} - 313300956i^{14} - 158520648i^{15}\right) +$
$\dfrac{1}{120120}\left(\left(-1274i^{13} - 1862i^{14} + 3312i^{15} + 8364i^{16} + 5457i^{17} + 387i^{18} - 1063i^{19} - 577i^{20} - 132i^{21} - 12i^{22}\right)\mathrm{Log20}[i]\right)$

$Q4\,[l=3,k_1=0,k_2=0,k_3=1,k_4=1]$

$= \dfrac{1}{195545750400\,i^7}$
$\left(62674920 + 157865400i - 1294129760i^2 - 2551101476i^3 - 747680472i^4 + 162001224i^5 + 205650060i^6 + 28443010i^7 + 25413465i^8 - 49796385i^9 - 63802030i^{10} - 280791310i^{11} - 424984400i^{12} - 638516736i^{13} - 481717032i^{14} - 317041296i^{15}\right) +$
$\dfrac{1}{371280}\left(\left(-2380i^{13} - 8500i^{14} + 42840i^{15} + 148614i^{16} + 130203i^{17} + 23629i^{18} - 14250i^{19} - 9330i^{20} - 2200i^{21} - 200i^{22}\right)\mathrm{Log20}[i]\right)$

$Q4\,[l=4,k_1=0,k_2=0,k_3=1,k_4=1]$

$= \dfrac{1}{586637251200\,i^5(1+i)}$
$\left(-419026608 - 3714266556i - 5508336834i^2 - 1384407024i^3 + 271993722i^4 + 317362794i^5 + 16426609i^6 - 12559960i^7 - 337387685i^8 - 781608180i^9 - 1814964702i^{10} - 2562642480i^{11} - 2901104604i^{12} - 1961620344i^{13} - 951123888i^{14}\right) +$
$\dfrac{1}{1627920}\left(\left(23256i^{15} + 207366i^{16} + 315267i^{17} + 82821i^{18} - 17330i^{19} - 16106i^{20} - 3960i^{21} - 360i^{22}\right)\mathrm{Log20}[i]\right)$

$Q4\,[l = 5, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$$\frac{1}{1075501627200 i^3 (1+i)^3} \left(-395405010 - 901800900i - 626636010i^2 - 97375346i^3 + \right.$$
$$23887979i^4 - 107556928i^5 - 653853081i^6 - 2280463020i^7 -$$
$$5755995091i^8 - 10834167190i^9 - 15354353663i^{10} - 16213936596i^{11} -$$
$$\left. 12367424520i^{12} - 6286891380i^{13} - 1743727128i^{14}\right) +$$
$$\frac{\left(21945i^{17} + 7315i^{18} - 385i^{19} - 847i^{20} - 220i^{21} - 20i^{22}\right)\text{Log20}[i]}{2984520}$$

$Q4\,[l = 6, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$$\frac{1}{57660926400(1+i)^5} \left(-42330 - 824446i - 7553952i^2 - 43193361i^3 - 172340330i^4 - \right.$$
$$507985935i^5 - 1141411524i^6 - 1986538543i^7 - 2689589364i^8 - 2812888155i^9 -$$
$$\left. 2224679600i^{10} - 1273434606i^{11} - 481310052i^{12} - 93486536i^{13}\right)$$

$Q4\,[l = 7, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$$= \frac{1}{22487761296000(1+i)^7}$$
$$\left(-14466450 - 310780459i - 3161569808i^2 - 20227499626i^3 - 91142943452i^4 - \right.$$
$$306826089910i^5 - 798542450960i^6 - 1639172395000i^7 - 2681364078470i^8 -$$
$$3503925540445i^9 - 3638556154640i^{10} - 2959575180250i^{11} -$$
$$\left. 1834945152920i^{12} - 825352688040i^{13} - 243968657160i^{14} - 36459749040i^{15}\right)$$

$Q4\,[l = 0, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$$= \frac{1}{586637251200}$$
$$\left(11812780 + 165653277i + 1063615860i^2 + 4121733508i^3 + 10680471330i^4 + \right.$$
$$\left. 19318075200i^5 + 23962889376i^6 + 18485729280i^7 + 6744333024i^8\right)$$

$Q4\,[l = 1, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$$= \frac{1}{32590958400} \left(402687 + 5662831i + 36485330i^2 + 142009546i^3 + \right.$$
$$\left. 370126365i^4 + 674961966i^5 + 869960448i^6 + 775200000i^7 + 374685168i^8\right)$$

Q4 $[l = 2, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{97772875200i^7}(-1471721076 - 2365641936i -$
$773476200i^2 + 254414034i^3 + 60933131i^4 - 58751784i^5 - 49964796i^6 +$
$28727i^7 - 954576i^8 + 92528286i^9 + 279358462i^{10} + 812191803i^{11} +$
$1392850404i^{12} + 1914718160i^{13} + 1570245120i^{14} + 1124055504i^{15}) +$
$\dfrac{1}{120120}\left((36162i^{13} + 96192i^{14} + 80080i^{15} + 13707i^{16} - 8082i^{17} -\right.$
$\left. 106i^{18} + 2718i^{19} + 1347i^{20} + 286i^{21} + 24i^{22}\right) \text{Log}20[i])$

Q4 $[l = 3, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$
$=$

$\dfrac{1}{586637251200i^7}\left(-21998896920 - 94170716640i - 70495996032i^2 + 8854023024i^3 +\right.$
$2189293260i^4 + 922166784i^5 - 3784861080i^6 + 2249752680i^7 -$
$2658128385i^8 + 3138877860i^9 - 1510958860i^{10} + 6544252650i^{11} +$
$3572290548i^{12} + 11449952064i^{13} + 4889341440i^{14} + 6744333024i^{15}) +$
$\dfrac{1}{1113840}\left((835380i^{13} + 4455360i^{14} + 6438648i^{15} + 2473704i^{16} - 435915i^{17} -\right.$
$\left. 122916i^{18} + 107700i^{19} + 64950i^{20} + 14300i^{21} + 1200i^{22}\right) \text{Log}20[i])$

Q4 $[l = 4, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$
$= \dfrac{1}{195545750400i^6(1+i)^2}$
$\left(-5587021440 - 29736186480i - 43861385568i^2 - 18461188746i^3 +\right.$
$2137955820i^4 + 674239566i^5 - 459316272i^6 - 250311275i^7 + 77210230i^8 +$
$555475905i^9 + 1804665610i^{10} + 4017909640i^{11} + 6792767862i^{12} +$
$8290460304i^{13} + 7667658240i^{14} + 4615292736i^{15} + 2248111008i^{16}) +$
$\dfrac{1}{542640}\left((310080i^{14} + 1356600i^{15} + 1147296i^{16} - 68115i^{17} -\right.$
$\left. 54036i^{18} + 14020i^{19} + 12350i^{20} + 2860i^{21} + 240i^{22}\right) \text{Log}20[i])$

Q4 $[l = 5, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$
$= \dfrac{1}{3226504881600i^4(1+i)^4}$
$\left(-20165655510 - 59435616240i - 57701383740i^2 - 16912235340i^3 +\right.$
$2076088785i^4 + 563758518i^5 + 1749637632i^6 + 11303792570i^7 +$
$41880699290i^8 + 112538230200i^9 + 228371757152i^{10} +$
$355855121798i^{11} + 425895872655i^{12} + 388082947890i^{13} +$
$261455890080i^{14} + 125413282368i^{15} + 37093831632i^{16}) +$
$\dfrac{\left(223839i^{16} - 8778i^{18} + 462i^{19} + 1155i^{20} + 286i^{21} + 24i^{22}\right) \text{Log}20[i]}{1790712}$

Q4 $[l = 6, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{57660926400(1+i)^6}$

$\big(217091 + 4361139i + 41357253i^2 + 245783073i^3 + 1024544808i^4 + 3175829619i^5 +$
$7568710326i^6 + 14133326097i^7 + 20863842087i^8 + 24362463972i^9 + 22329346611$
$i^{10} + 15788955084i^{11} + 8359942848i^{12} + 3121606368i^{13} + 662904528i^{14}\big)$

Q4 $[l = 7, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 0]$

$=$

$\dfrac{1}{7495920432000(1+i)^8} \big(24623172 + 543904049i + 5704846412i^2 + 37753980864i^3 +$
$176650709106i^4 + 620477659638i^5 + 1694936376600i^6 + 3679512232380i^7 +$
$6428877949800i^8 + 9094037910375i^9 + 10415682056340i^{10} +$
$9604063641660i^{11} + 7043742963150i^{12} + 4026173530380i^{13} +$
$1732036285120i^{14} + 520253464320i^{15} + 86177588640i^{16}\big)$

Q4 $[l = 0, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{195545750400} \big(-711648 - 10244349i - 67542846i^2 - 268831616i^3 - 715536295i^4 -$
$1329249348i^5 - 1698199632i^6 - 1358569008i^7 - 518794848i^8\big)$

Q4 $[l = 1, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{21727305600} \big(-50121 - 723886i - 4791654i^2 - 19164544i^3 -$
$51324035i^4 - 96123888i^5 - 127086288i^6 - 115861392i^7 - 57643872i^8\big)$

Q4 $[l = 2, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{65181916800 i^7}$

$\big(327049128 + 634443264i + 274760528i^2 - 66370374i^3 - 25408110i^4 +$
$14285040i^5 + 12449304i^6 + 2150171i^7 - 101616i^8 - 11886618i^9 - 39189520i^{10} -$
$114327237i^{11} - 204165108i^{12} - 285134064i^{13} - 242312016i^{14} - 172931616i^{15}\big) +$

$\dfrac{1}{80080} \big(\big(-8036i^{13} - 24048i^{14} - 23136i^{15} - 5457i^{16} + 2340i^{17} +$
$302i^{18} - 672i^{19} - 381i^{20} - 88i^{21} - 8i^{22}\big) \text{Log20}[i]\big)$

Q4 $[l = 3, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{195545750400i^7}$

$(2444321880 + 12092960880i + 11549401248i^2 - 925351812i^3 - 674036748i^4 +$
$43361472i^5 + 289757160i^6 - 67581710i^7 + 129884865i^8 - 164099910i^9 +$
$56747840i^{10} - 423575075i^{11} - 308893032i^{12} -$
$833076432i^{13} - 411119568i^{14} - 518794848i^{15}) +$
$\dfrac{1}{371280} \left(\left(-92820i^{13} - 556920i^{14} - 921672i^{15} - 425442i^{16} + 62667i^{17} + \right. \right.$
$\left. \left. 25102i^{18} - 12600i^{19} - 9165i^{20} - 2200i^{21} - 200i^{22} \right) \text{Log20}[i] \right)$

Q4 $[l = 4, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{65181916800i^6(1+i)} \left(698377680 + 3455131680i + 3314026716i^2 - 199008810i^3 - \right.$
$135957822i^4 - 3459456i^5 + 61121538i^6 - 27317747i^7 +$
$30206905i^8 - 72682730i^9 - 51828765i^{10} - 248940793i^{11} -$
$256203372i^{12} - 390700800i^{13} - 204699312i^{14} - 172931616i^{15} \right) +$
$\dfrac{1}{180880} \left(\left(-38760i^{14} - 193800i^{15} - 191862i^{16} + 9747i^{17} + 9462i^{18} - \right. \right.$
$\left. \left. 1400i^{19} - 1737i^{20} - 440i^{21} - 40i^{22} \right) \text{Log20}[i] \right)$

Q4 $[l = 5, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{2151003254400i^4(1+i)^3}$

$(6721885170 + 13089986910i + 6143807670i^2 - 520269750i^3 - 215316853i^4 +$
$21556149i^5 - 206754813i^6 - 1343607951i^7 - 4619644315i^8 -$
$11801267709i^9 - 22263285275i^{10} - 32015852473i^{11} - 34272903456i^{12} -$
$27295567200i^{13} - 14694582672i^{14} - 5706743328i^{15}) +$
$\dfrac{\left(-373065i^{16} + 14630i^{18} - 1617i^{20} - 440i^{21} - 40i^{22} \right) \text{Log20}[i]}{5969040}$

Q4 $[l = 6, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{38440617600(1+i)^5} \left(-28413 - 553923i - 5081442i^2 - 29100692i^3 - 116347460i^4 - \right.$
$343885282i^5 - 775650942i^6 - 1357485668i^7 - 1853584513i^8 - 1965558265i^9 -$
$1593059028i^{10} - 957092928i^{11} - 404494192i^{12} - 101985312i^{13} \right)$

$Q4\,[l = 7, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{2498640144000(1+i)^7}$

$(-1616076 - 34741957i - 353731105i^2 - 2265556939i^3 - 10222200428i^4 -$
$34473003670i^5 - 89930220770i^6 - 185197136890i^7 - 304340470280i^8 -$
$400422046255i^9 - 420256153295i^{10} - 347935731385i^{11} -$
$222681862760i^{12} - 106489068960i^{13} - 35514780240i^{14} - 6629045280i^{15})$

$Q4\,[l = 0, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200}\left(3100864 + 42403394i + 263772235i^2 + 980808106i^3 + \right.$
$\left. 2401734900i^4 + 3997213236i^5 + 4434326172i^6 + 3001070520i^7 + 951123888i^8\right)$

$Q4\,[l = 1, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{97772875200}\left(326872 + 4506581i + 28336945i^2 + 106939371i^3 + \right.$
$\left. 267577380i^4 + 460842606i^5 + 544105128i^6 + 414169980i^7 + 158520648i^8\right)$

$Q4\,[l = 2, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{97772875200i^6}\left(138454596 + 268401168i + 135948456i^2 - 35705082i^3 - \right.$
$60534411i^4 - 27081474i^5 - 4776408i^6 + 2107981i^7 + 21194378i^8 + 76270303i^9 +$
$196899432i^{10} + 339612270i^{11} + 416776590i^{12} + 328161540i^{13} + 158520648i^{14}\big) +$
$\dfrac{1}{120120}\left(\left(-3402i^{14} - 10176i^{15} - 10272i^{16} - 2631i^{17} + 2412i^{18} + \right.\right.$
$\left.\left. 2227i^{19} + 824i^{20} + 154i^{21} + 12i^{22}\right)\text{Log20}[i]\right)$

$Q4\,[l = 3, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200i^6}\left(1692222840 + 7759626336i + 7405630848i^2 + \right.$
$178613820i^3 - 1527097572i^4 - 973484820i^5 - 34344800i^6 -$
$149702190i^7 + 249954705i^8 + 197046050i^9 + 1078799100i^{10} +$
$1433252916i^{11} + 2142412488i^{12} + 1452918600i^{13} + 951123888i^{14}\big) +$
$\dfrac{1}{1113840}\left(\left(-64260i^{14} - 362304i^{15} - 591192i^{16} - 302130i^{17} + \right.\right.$
$\left.\left. 50923i^{18} + 97950i^{19} + 40140i^{20} + 7700i^{21} + 600i^{22}\right)\text{Log20}[i]\right)$

Q4 $[l = 4, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200 i^5 (1 + i)^2}$

$\big(1117404288 + 6226588368i + 10191713532i^2 + 5454078630i^3 - $
$462666204i^4 - 1240661786i^5 - 468256538i^6 + 15873021i^7 + 447731590i^8 + $
$1399411225i^9 + 3077047542i^{10} + 4979084976i^{11} + 5886626436i^{12} + $
$5014749420i^{13} + 2839115736i^{14} + 951123888i^{15}\big) + $

$\dfrac{1}{1627920} \big(\big(-62016i^{15} - 286824i^{16} - 293550i^{17} - 23351i^{18} + $
$48050i^{19} + 23236i^{20} + 4620i^{21} + 360i^{22}\big) \text{Log20}[i]\big)$

Q4 $[l = 5, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{3226504881600 i^3 (1 + i)^4}$

$\big(1186215030 + 3759816060i + 4113599490i^2 + 1524789448i^3 - 189640757i^4 + $
$259966512i^5 + 2979700407i^6 + 11077504488i^7 + 29195592393i^8 + $
$57901940096i^9 + 87658513019i^{10} + 101220156312i^{11} + $
$87822908118i^{12} + 55182069360i^{13} + 23239220796i^{14} + 5231181384i^{15}\big) + $

$\dfrac{\big(-65835i^{17} - 14630i^{18} + 5775i^{19} + 3696i^{20} + 770i^{21} + 60i^{22}\big) \text{Log20}[i]}{8953560}$

Q4 $[l = 6, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{57660926400 (1 + i)^6}$

$\big(60792 + 1209503i + 11346851i^2 + 66621856i^3 + 273934701i^4 + 835961998i^5 + $
$1956718077i^6 + 3577804054i^7 + 5151308459i^8 + 5834977709i^9 + $
$5146210762i^{10} + 3454491118i^{11} + 1690350086i^{12} + 551558676i^{13} + 93486536i^{14}\big)$

Q4 $[l = 7, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{22487761296000 (1 + i)^8}$

$\big(20717024 + 453694118i + 4713708453i^2 + 30868865502i^3 + 142758406680i^4 + $
$494927187552i^5 + 1332252812370i^6 + 2844383326860i^7 + 4875898997340i^8 + $
$6746666621970i^9 + 7528706837355i^{10} + 6726477658050i^{11} + 4739283432660i^{12} + $
$2564086496340i^{13} + 1016134756920i^{14} + 268245440520i^{15} + 36459749040i^{16}\big)$

Q4 $[l = 0, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200} \big(-558662 - 7845654i - 50147451i^2 - 191704996i^3 - $
$482927370i^4 - 827646669i^5 - 947612232i^6 - 664609968i^7 - 219490128i^8\big)$

$\mathrm{Q4}\left[l=1, k_1=0, k_2=1, k_3=1, k_4=1\right]$

$= \dfrac{1}{65181916800}\left(-40396 - 572001i - 3695524i^2 - 14334404i^3 - \right.$
$\left. 36871590i^4 - 65279193i^5 - 79198308i^6 - 61907472i^7 - 24387792i^8\right)$

$\mathrm{Q4}\left[l=2, k_1=0, k_2=1, k_3=1, k_4=1\right]$

$= \dfrac{1}{195545750400i^6}$
$\left(-92303064 - 208887840i - 129102624i^2 + 17281474i^3 + 47456262i^4 + \right.$
$22915116i^5 + 4873008i^6 - 602601i^7 - 8357034i^8 - 31356716i^9 - 82806978i^{10} - $
$\left. 147278367i^{11} - 185184944i^{12} - 149908176i^{13} - 73163376i^{14}\right) + $
$\dfrac{1}{240240}\left(\left(2268i^{14} + 7520i^{15} + 8568i^{16} + 2907i^{17} - 1614i^{18} - \right.\right.$
$\left.\left. 1788i^{19} - 714i^{20} - 143i^{21} - 12i^{22}\right)\mathrm{Log20}[i]\right)$

$\mathrm{Q4}\left[l=3, k_1=0, k_2=1, k_3=1, k_4=1\right]$

$= \dfrac{1}{586637251200i^6}$
$\left(-564074280 - 2962591632i - 3434538492i^2 - 318476928i^3 + 627486552i^4 + \right.$
$376007940i^5 + 63115990i^6 + 25524840i^7 - 41844165i^8 - 49469300i^9 - $
$\left. 221698650i^{10} - 322777377i^{11} - 475922412i^{12} - 342281808i^{13} - 219490128i^{14}\right) + $
$\dfrac{1}{1113840}\left(\left(21420i^{14} + 135048i^{15} + 248778i^{16} + 149112i^{17} - 11183i^{18} - \right.\right.$
$\left.\left. 39300i^{19} - 17430i^{20} - 3575i^{21} - 300i^{22}\right)\mathrm{Log20}[i]\right)$

$\mathrm{Q4}\left[l=4, k_1=0, k_2=1, k_3=1, k_4=1\right]$
$=$

$\dfrac{1}{195545750400i^5(1+i)}\left(-139675536 - 725945220i - 828167340i^2 - 85447362i^3 + \right.$
$108222114i^4 + 62821486i^5 + 6607966i^6 + 386485i^7 - 31222995i^8 - 67064530i^9 - $
$\left. 156712437i^{10} - 212130231i^{11} - 236242200i^{12} - 151443072i^{13} - 73163376i^{14}\right) + $
$\dfrac{1}{542640}\left(\left(7752i^{15} + 40698i^{16} + 47652i^{17} + 5377i^{18} - 6420i^{19} - \right.\right.$
$\left.\left. 3374i^{20} - 715i^{21} - 60i^{22}\right)\mathrm{Log20}[i]\right)$

$Q4\,[l = 5, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{6453009763200i^3(1+i)^3}$

$\left(-1186215030 - 2573601030i - 1560809250i^2 - 31206214i^3 + 177926511i^4 - \right.$

$130287021i^5 - 1047889937i^6 - 3617838345i^7 - 8977723755i^8 -$

$16553067223i^9 - 22928119071i^{10} - 23575263327i^{11} -$

$\left. 17491205820i^{12} - 8644534272i^{13} - 2414391408i^{14}\right) +$

$\dfrac{\left(65835i^{17} + 14630i^{18} - 4620i^{19} - 3234i^{20} - 715i^{21} - 60i^{22}\right) \text{Log20}[i]}{17907120}$

$Q4\,[l = 6, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{115321852800(1+i)^5}\left(-23588 - 454993i - 4124417i^2 - 23303862i^3 - 91752240i^4 - \right.$

$266444052i^5 - 588749722i^6 - 1005636038i^7 - 1333400068i^8 - 1363048885i^9 -$

$\left. 1052583983i^{10} - 589208848i^{11} - 219660672i^{12} - 43147632i^{13}\right)$

$Q4\,[l = 7, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{7495920432000(1+i)^7}$

$\left(-1343422 - 28608124i - 288241627i^2 - 1824731657i^3 - 8126676937i^4 - \right.$

$27007614800i^5 - 69295536730i^6 - 140022444050i^7 - 225117588520i^8 -$

$288678566000i^9 - 293787214105i^{10} - 234057862055i^{11} -$

$\left. 142273878055i^{12} - 62997474260i^{13} - 18514256640i^{14} - 2804596080i^{15}\right)$

$Q4\,[l = 0, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200}\left(2881697 + 39005736i + 239493351i^2 + 875518846i^3 + \right.$

$\left. 2096020245i^4 + 3384906012i^5 + 3619110348i^6 + 2353809528i^7 + 718331328i^8\right)$

$Q4\,[l = 1, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{65181916800}\left(208362 + 2854032i + 17794889i^2 + 66401174i^3 + \right.$

$\left. 163564065i^4 + 275375436i^5 + 313998636i^6 + 225901032i^7 + 79814592i^8\right)$

Q4 $[l = 2, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400 i^6}$

$\left(88884432 + 161695296 i + 26883528 i^2 - 133613536 i^3 - 129666642 i^4 - \right.$
$54005868 i^5 - 10288908 i^6 + 4910304 i^7 + 39641907 i^8 + 146898746 i^9 + $
$\left. 369588399 i^{10} + 632859828 i^{11} + 750046052 i^{12} + 570803016 i^{13} + 239443776 i^{14} \right) + $

$\dfrac{1}{240240} \left(\left(-2184 i^{14} - 6272 i^{15} - 4836 i^{16} + 2592 i^{17} + 6639 i^{18} + \right. \right.$
$\left. \left. 4674 i^{19} + 1659 i^{20} + 308 i^{21} + 24 i^{22} \right) \text{Log20}[i] \right)$

Q4 $[l = 3, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200 i^6} \left(161164080 + 1033712064 i + 632804634 i^2 - \right.$
$1533801192 i^3 - 1856168622 i^4 - 889631820 i^5 - 134367085 i^6 - $
$46301640 i^7 + 140010255 i^8 + 295912550 i^9 + 928841505 i^{10} + $
$\left. 1464253164 i^{11} + 1891561644 i^{12} + 1391708808 i^{13} + 718331328 i^{14} \right) + $

$\dfrac{1}{1113840} \left(\left(-6120 i^{14} - 45696 i^{15} - 65331 i^{16} + 33048 i^{17} + 131753 i^{18} + \right. \right.$
$\left. \left. 107850 i^{19} + 40635 i^{20} + 7700 i^{21} + 600 i^{22} \right) \text{Log20}[i] \right)$

Q4 $[l = 4, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400 i^4 (1 + i)^2}$

$\left(52378326 + 24972948 i - 340396056 i^2 - 646557912 i^3 - 470596581 i^4 - 158701914 \right.$
$i^5 + 4376698 i^6 + 146231220 i^7 + 453282540 i^8 + 992717932 i^9 + 1588712835 i^{10} + $
$\left. 1855223460 i^{11} + 1536868884 i^{12} + 835890408 i^{13} + 239443776 i^{14} \right) + $

$\dfrac{1}{542640} \left(\left(-2907 i^{16} + 1368 i^{17} + 17613 i^{18} + 19170 i^{19} + 7903 i^{20} + 1540 i^{21} + 120 i^{22} \right) \right.$
$\left. \text{Log20}[i] \right)$

Q4 $[l = 5, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{6453009763200 i^2 (1 + i)^4}$

$\left(-131801670 - 679819140 i - 1370520788 i^2 - 1262892704 i^3 - \right.$
$412357017 i^4 + 5853895106 i^5 + 21734269349 i^6 + 57069127896 i^7 + $
$112619226181 i^8 + 169264384366 i^9 + 193355359131 i^{10} + $
$\left. 164857970244 i^{11} + 100511939748 i^{12} + 39859970040 i^{13} + 7901644608 i^{14} \right) + $

$\dfrac{\left(7315 i^{18} + 16170 i^{19} + 7623 i^{20} + 1540 i^{21} + 120 i^{22} \right) \text{Log20}[i]}{17907120}$

$Q4\,[l=6,k_1=1,k_2=0,k_3=1,k_4=0]$

$$=\frac{1}{115321852800(1+i)^6}$$
$$\big(120526+2395652i+22448403i^2+131614084i^3+540193382i^4+1644695124i^5+$$
$$3838051768i^6+6989120952i^7+10005611616i^8+11239873128i^9+9788460451$$
$$i^{10}+6437864772i^{11}+3041521748i^{12}+931715464i^{13}+141210432i^{14}\big)$$

$Q4\,[l=7,k_1=1,k_2=0,k_3=1,k_4=0]$

$$=\frac{1}{7495920432000(1+i)^8}$$
$$\big(6857781+150077424i+1557945539i^2+10192298430i^3+47077822335i^4+$$
$$162962451324i^5+437809334430i^6+932369437860i^7+1592928767385i^8+$$
$$2194016070840i^9+2432555710365i^{10}+2152884812730i^{11}+1495140339675i^{12}+$$
$$790592440740i^{13}+301741167140i^{14}+74821024920i^{15}+9178678080i^{16}\big)$$

$Q4\,[l=0,k_1=1,k_2=0,k_3=1,k_4=1]$

$$=\frac{1}{586637251200}\big(-530075-7382337i-46679039i^2-175911607i^3-$$
$$434656635i^4-725595465i^5-803750616i^6-543248532i^7-172931616i^8\big)$$

$Q4\,[l=1,k_1=1,k_2=0,k_3=1,k_4=1]$

$$=\frac{1}{195545750400}\big(-117450-1654494i-10616683i^2-40801929i^3-$$
$$103594365i^4-179911095i^5-211792392i^6-157478004i^7-57643872i^8\big)$$

$Q4\,[l=2,k_1=1,k_2=0,k_3=1,k_4=1]$

$$=\frac{1}{195545750400i^6}$$
$$\big(-29628144-59976000i-11680088i^2+53730040i^3+53501994i^4+23268546i^5+$$
$$4969020i^6-697284i^7-7964627i^8-30510437i^9-78984273i^{10}-$$
$$139550915i^{11}-170448392i^{12}-133873164i^{13}-57643872i^{14}\big)+$$
$$\frac{1}{240240}\big(\big(728i^{14}+2240i^{15}+1836i^{16}-1020i^{17}-2703i^{18}-$$
$$1953i^{19}-725i^{20}-143i^{21}-12i^{22}\big)\,\mathrm{Log20}[i]\big)$$

$Q4\,[l = 3, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200i^6}$

$\left(-53721360 - 373222080i - 223752606i^2 + 721149198i^3 + 812970774i^4 + \right.$

$376389090i^5 + 76162375i^6 + 11424765i^7 - 26137815i^8 - 64299275i^9 -$

$\left. 198021135i^{10} - 327944085i^{11} - 431654616i^{12} - 330804972i^{13} - 172931616i^{14}\right) +$

$\dfrac{1}{1113840}\left(\left(2040i^{14} + 16320i^{15} + 23409i^{16} - 18477i^{17} - 59681i^{18} - \right.\right.$

$\left.\left. 46725i^{19} - 17925i^{20} - 3575i^{21} - 300i^{22}\right)\,\mathrm{Log20}[i]\right)$

$Q4\,[l = 4, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{586637251200i^4(1+i)}\left(-52378326 + 108540432i + 524395872i^2 + 456419964i^3 + \right.$

$186149145i^4 + 31167780i^5 - 10872950i^6 - 79077650i^7 - 211073970i^8 -$

$\left. 442676820i^9 - 629503041i^{10} - 656295948i^{11} - 432922068i^{12} - 172931616i^{13}\right) +$

$\dfrac{1}{1627920}\left(\left(2907i^{16} - 5871i^{17} - 29583i^{18} - 26355i^{19} - \right.\right.$

$\left.\left. 10595i^{20} - 2145i^{21} - 180i^{22}\right)\,\mathrm{Log20}[i]\right)$

$Q4\,[l = 5, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{6453009763200i^2(1+i)^3}\left(131801670 + 402341940i + 470228720i^2 + 246894564i^3 - \right.$

$125672565i^4 - 1033439270i^5 - 3568898685i^6 - 8817196080i^7 -$

$16189368349i^8 - 22247872350i^9 - 22619918475i^{10} -$

$\left. 16407825060i^{11} - 7787678580i^{12} - 1902247776i^{13}\right) +$

$\dfrac{\left(-1463i^{18} - 1617i^{19} - 693i^{20} - 143i^{21} - 12i^{22}\right)\,\mathrm{Log20}[i]}{3581424}$

$Q4\,[l = 6, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{115321852800(1+i)^5}\left(-23450 - 451984i - 4093243i^2 - 23099944i^3 - 90808550i^4 - \right.$

$263164160i^5 - 579884096i^6 - 986609932i^7 - 1300635556i^8 - 1317694840i^9 -$

$\left. 1002571955i^{10} - 546447524i^{11} - 193243148i^{12} - 33995104i^{13}\right)$

$Q4[l = 7, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{22487761296000(1+i)^7}$

$\left(-4011525 - 85377858i - 859645519i^2 - 5437510546i^3 - 24191381361i^4 - \right.$
$80288699120i^5 - 205644210470i^6 - 414566866740i^7 - 664364273485i^8 -$
$848027954950i^9 - 857134218105i^{10} - 675596821550i^{11} -$
$\left.403491751145i^{12} - 173293459980i^{13} - 48225947820i^{14} - 6629045280i^{15}\right)$

$Q4[l = 0, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200}\left(826280 + 11064703i + 67100470i^2 + 241783467i^3 + \right.$
$\left.569038980i^4 + 900257715i^5 + 938453244i^6 + 591031860i^7 + 172931616i^8\right)$

$Q4[l = 1, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400}\left(178608 + 2419874i + 14899430i^2 + 54790869i^3 + \right.$
$\left.132667500i^4 + 218831949i^5 + 243401172i^6 + 169788180i^7 + 57643872i^8\right)$

$Q4[l = 2, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400i^5}\left(-54698112 - 150796800i - 167181672i^2 - 97693484i^3 - \right.$
$32689650i^4 - 5730536i^5 + 1176700i^6 + 11041798i^7 + 40284417i^8 +$
$\left.99639420i^9 + 167094417i^{10} + 193199220i^{11} + 142565740i^{12} + 57643872i^{13}\right) +$
$\dfrac{1}{240240}\left(\left(1344i^{15} + 5120i^{16} + 8004i^{17} + 6718i^{18} + 3325i^{19} + \right.\right.$
$\left.\left.988i^{20} + 165i^{21} + 12i^{22}\right) \text{Log20}[i]\right)$

$Q4[l = 3, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200i^5}$

$\left(-257862528 - 1415416464i - 2206990170i^2 - 1456197204i^3 - 529902450i^4 - \right.$
$83078240i^5 - 16918275i^6 + 39541590i^7 + 80340975i^8 + 250554900i^9 +$
$\left.385016247i^{10} + 486635676i^{11} + 346029900i^{12} + 172931616i^{13}\right) +$
$\dfrac{1}{1113840}\left(\left(9792i^{15} + 64056i^{16} + 140355i^{17} + 143386i^{18} + \right.\right.$
$\left.\left.78225i^{19} + 24300i^{20} + 4125i^{21} + 300i^{22}\right) \text{Log20}[i]\right)$

$Q4\,[l=4, k_1=1, k_2=1, k_3=1, k_4=0]$

$= \dfrac{1}{586637251200i^4(1+i)^2}$

$\left(-139675536 - 897458562i - 1931409480i^2 - 1920826908i^3 - \right.$

$993875064i^4 - 285326405i^5 - 18095160i^6 + 119153100i^7 + 368767000i^8 +$

$794020950i^9 + 1247553414i^{10} + 1425088863i^{11} +$

$\left. 1152974340i^{12} + 610225812i^{13} + 172931616i^{14}\right) + \dfrac{1}{1627920}$

$\left(\left(7752i^{16} + 42465i^{17} + 66918i^{18} + 43015i^{19} + 14260i^{20} + 2475i^{21} + 180i^{22}\right)\right.$

$\left. \text{Log20}[i]\right)$

$Q4\,[l=5, k_1=1, k_2=1, k_3=1, k_4=0]$

$= \dfrac{1}{6453009763200i^2(1+i)^4}$

$\left(-263603340 - 1005854850i - 1520323480i^2 - 1135697836i^3 - 177413574i^4 + \right.$

$1549814675i^5 + 5916396140i^6 + 15346944195i^7 + 29828781906i^8 +$

$44077277079i^9 + 49413293160i^{10} + 41287131765i^{11} +$

$\left. 24662154660i^{12} + 9618638964i^{13} + 1902247776i^{14}\right) +$

$\dfrac{\left(2926i^{18} + 2541i^{19} + 924i^{20} + 165i^{21} + 12i^{22}\right)\text{Log20}[i]}{3581424}$

$Q4\,[l=6, k_1=1, k_2=1, k_3=1, k_4=0]$

$= \dfrac{1}{345965558400(1+i)^6}$

$\left(102704 + 2025206i + 18812202i^2 + 109242947i^3 + 443669372i^4 + 1335206706i^5 + \right.$

$3076189464i^6 + 5523464628i^7 + 7786696368i^8 + 8603344948i^9 + 7362891514i^{10} +$

$\left. 4758983751i^{11} + 2213752852i^{12} + 671492452i^{13} + 101985312i^{14}\right)$

$Q4\,[l=7, k_1=1, k_2=1, k_3=1, k_4=0]$

$= \dfrac{1}{22487761296000(1+i)^8}$

$\left(5841528 + 126911969i + 1307118858i^2 + 8478372837i^3 + 38797607028i^4 + \right.$

$132942107811i^5 + 353226671880i^6 + 743243317530i^7 + 1253376035520i^8 +$

$1702337111805i^9 + 1859617042470i^{10} + 1620695162955i^{11} + 1108412664540i^{12} +$

$\left. 577814053335i^{13} + 218047538940i^{14} + 53774519340i^{15} + 6629045280i^{16}\right)$

$Q4\,[l=0, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{586637251200}\left(-148421 - 2041923i - 12730647i^2 - 47195797i^3 - \right.$

$\left. 114383325i^4 - 186581691i^5 - 200937654i^6 - 131128956i^7 - 39907296i^8\right)$

$Q4\,[l=1, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{65181916800}\left(-10962 - 152542i - 965153i^2 - 3648953i^3 - \right.$
$\left. 9087225i^4 - 15420951i^5 - 17649366i^6 - 12670644i^7 - 4434144i^8\right)$

$Q4\,[l=2, k_1=1, k_2=1, k_3=1, k_4=1]$
$=$

$\dfrac{1}{195545750400i^5}\left(18232704 + 55529208i + 66140200i^2 + 40489974i^3 + 14233590i^4 + \right.$
$2726220i^5 - 88956i^6 - 2172171i^7 - 8185727i^8 - 20785335i^9 - $
$\left. 35884521i^{10} - 42612098i^{11} - 32314212i^{12} - 13302432i^{13}\right) + \dfrac{1}{240240}$
$\left(\left(-448i^{15} - 1836i^{16} - 3060i^{17} - 2703i^{18} - 1395i^{19} - 435i^{20} - 77i^{21} - 6i^{22}\right)\right.$
$\left.\text{Log20}[i]\right)$

$Q4\,[l=3, k_1=1, k_2=1, k_3=1, k_4=1]$
$= \dfrac{1}{586637251200i^5}$
$\left(85954176 + 525974526i + 906327114i^2 + 618916914i^3 + 228655350i^4 + \right.$
$42919345i^5 + 4840935i^6 - 7128495i^7 - 17251025i^8 - 52110825i^9 - $
$\left. 84328479i^{10} - 107913654i^{11} - 79849476i^{12} - 39907296i^{13}\right) + $
$\dfrac{1}{1113840}\left(\left(-3264i^{15} - 23409i^{16} - 55431i^{17} - 59681i^{18} - \right.\right.$
$\left.\left. 33375i^{19} - 10755i^{20} - 1925i^{21} - 150i^{22}\right)\text{Log20}[i]\right)$

$Q4\,[l=4, k_1=1, k_2=1, k_3=1, k_4=1]$
$= \dfrac{1}{195545750400i^4(1+i)}$
$\left(17459442 + 104864760i + 173128956i^2 + 108756648i^3 + 36974301i^4 + 6018376i^5 - \right.$
$672540i^6 - 7186520i^7 - 18517990i^8 - 38363736i^9 - 53013819i^{10} - $
$\left. 53944230i^{11} - 34221204i^{12} - 13302432i^{13}\right) + $
$\dfrac{\left(-969i^{16} - 5871i^{17} - 9861i^{18} - 6275i^{19} - 2119i^{20} - 385i^{21} - 30i^{22}\right)\text{Log20}[i]}{542640}$

$Q4\,[l=5, k_1=1, k_2=1, k_3=1, k_4=1]$
$= \dfrac{1}{6453009763200i^2(1+i)^3}$
$\left(131801670 + 360720360i + 365299844i^2 + 171646488i^3 - 8113521i^4 - \right.$
$275997032i^5 - 951744585i^6 - 2314504038i^7 - 4171347565i^8 - 5613548556i^9 - $
$\left. 5572438047i^{10} - 3938393910i^{11} - 1819235484i^{12} - 438980256i^{13}\right) + $
$\dfrac{\left(-7315i^{18} - 5775i^{19} - 2079i^{20} - 385i^{21} - 30i^{22}\right)\text{Log20}[i]}{17907120}$

Q4 $[l = 6, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$=$

$\frac{1}{115321852800(1+i)^5} \left(-6566 - 125416i - 1124519i^2 - 6276534i^3 - 24373650i^4 - \right.$

$69680064i^5 - 151230244i^6 - 252997976i^7 - 327354676i^8 - 324953200i^9 - $

$\left. 241950731i^{10} - 129071446i^{11} - 44841444i^{12} - 7845024i^{13}\right)$

Q4 $[l = 7, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \frac{1}{7495920432000(1+i)^7}$

$\left(-374409 - 7903582i - 78871005i^2 - 494032804i^3 - 2174551771i^4 - \right.$

$7132915350i^5 - 18035865530i^6 - 35849754080i^7 - 56572546965i^8 - $

$71016611710i^9 - 70511326435i^{10} - 54556347300i^{11} - $

$\left. 31988764895i^{12} - 13512088070i^{13} - 3716134380i^{14} - 509926560i^{15}\right)$

Case 5: $i_1 = i$, $i_2 = i_3 = i_4 = i + 1$

Q5 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{1}{195545750400}$

$\left(368671121 + 4003849486i + 19455389616i^2 + 55412719208i^3 + 101514697960i^4 + \right.$

$\left. 122879193696i^5 + 96169017408i^6 + 44521937568i^7 + 9338307264i^8\right)$

Q5 $[l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \frac{1}{10863652800} \left(13489065 + 148369694i + 732781182i^2 + 2132275236i^3 + \right.$

$\left. 4021955910i^4 + 5074931540i^5 + 4226695312i^6 + 2152559856i^7 + 518794848i^8\right)$

Q5 $[l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$=$

$\frac{1}{16295479200i^4} \left(35529354 + 14612724i - 6034014i^2 - 14814324i^3 + 15905176i^4 + \right.$

$156984296i^5 + 812432181i^6 + 2370131902i^7 + 4558905752i^8 + $

$\left. 5870954628i^9 + 5084288736i^{10} + 2747518104i^{11} + 778192272i^{12}\right) + $

$\frac{\left(-873i^{16} - 1278i^{17} - 227i^{18} + 518i^{19} + 354i^{20} + 88i^{21} + 8i^{22}\right) \text{Log20}[i]}{20020}$

Q5 $[l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{195545750400i^4(1+i)^2}$

$\big(1462564026 + 4831180200i + 4889074806i^2 + 619605756i^3 - 1621825961i^4 +$
$704922400i^5 + 10429007075i^6 + 38843109690i^7 + 95253688420i^8 +$
$164981868680i^9 + 205783220276i^{10} + 184164717720i^{11} +$
$114688886496i^{12} + 45870971616i^{13} + 9338307264i^{14}\big) +$

$\dfrac{1}{371280} \big(\big(-55539i^{16} - 130842i^{17} - 61376i^{18} + 35000i^{19} +$
$33480i^{20} + 8800i^{21} + 800i^{22}\big) \mathrm{Log20}[i]\big)$

Q5 $[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{65181916800i^4(1+i)^4}$

$\big(52378326 + 509729220i + 1577223648i^2 + 2149138992i^3 + 1225734237i^4 +$
$418382874i^5 + 3407205022i^6 + 16541991936i^7 + 49740615729i^8 +$
$107309770526i^9 + 172607624280i^{10} + 209581752696i^{11} + 191717522632i^{12} +$
$129861580608i^{13} + 62545182528i^{14} + 19590575328i^{15} + 3112769088i^{16}\big) +$

$\dfrac{1}{180880} \big(\big(-2907i^{16} - 19722i^{17} - 20976i^{18} + 2520i^{19} + 6184i^{20} + 1760i^{21} + 160i^{22}\big)$
$\mathrm{Log20}[i]\big)$

Q5 $[l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{1075501627200i^2(1+i)^6}$

$\big(263603340 + 1331890560i + 3168863893i^2 + 11133474092i^3 +$
$69898380903i^4 + 344894924226i^5 + 1202784223992i^6 + 3093179898780i^7 +$
$6060015255456i^8 + 9210914359812i^9 + 10946392470684i^{10} +$
$10159985558668i^{11} + 7286714625938i^{12} + 3943960589052i^{13} +$
$1539182964528i^{14} + 394198641936i^{15} + 51360689952i^{16}\big) +$

$\dfrac{\big(-7315i^{18} - 770i^{19} + 1386i^{20} + 440i^{21} + 40i^{22}\big) \mathrm{Log20}[i]}{1492260}$

Q5 $[l = 6, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{57660926400(1+i)^8}$

$\big(22864135 + 438151546i + 3967130546i^2 + 22543952796i^3 + 90069777782i^4 +$
$268533171940i^5 + 618711512208i^6 + 1125325459224i^7 + 1635636686949i^8 +$
$1910146973798i^9 + 1791159417890i^{10} + 1339148225332i^{11} + 786335985576i^{12} +$
$352971545896i^{13} + 115394122112i^{14} + 24938261520i^{15} + 2753603424i^{16}\big)$

$Q5 [l = 7, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$$= \frac{1}{2498640144000(1+i)^{10}}$$
$$\big(862626681 + 18261257784i + 183711793145i^2 + 1167607479126i^3 +$$
$$5256713924622i^4 + 17814408610976i^5 + 47131137342702i^6 +$$
$$99625332659772i^7 + 170744417332755i^8 + 239347720704240i^9 +$$
$$275506401584475i^{10} + 260305217300730i^{11} + 200889493966260i^{12} +$$
$$125343802431960i^{13} + 62128975312140i^{14} + 23764207478760i^{15} +$$
$$6671162361120i^{16} + 1245500971680i^{17} + 119322815040i^{18}\big)$$

$Q5 [l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$$= \frac{1}{586637251200}$$
$$\big(-106327585 - 1201100901i - 6079197696i^2 - 18063797468i^3 - 34589687910i^4 -$$
$$43873213500i^5 - 36113304408i^6 - 17680327488i^7 - 3950822304i^8\big)$$

$Q5 [l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$$= \frac{1}{32590958400} \big(-4129665 - 47173629i - 242179707i^2 - 733114746i^3 -$$
$$1439574045i^4 - 1891999480i^5 - 1641829672i^6 - 871541856i^7 - 219490128i^8\big)$$

$Q5 [l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$=$

$$\frac{1}{97772875200i^4} \big(-71058708 - 51934932i + 17292366i^2 + 27559476i^3 - 2426060i^4 -$$
$$104935488i^5 - 559071543i^6 - 1701171098i^7 - 3395801733i^8 -$$
$$4547637270i^9 - 4081145052i^{10} - 2282529888i^{11} - 658470384i^{12}\big) +$$
$$\frac{\big(1746i^{16} + 3114i^{17} + 913i^{18} - 1122i^{19} - 885i^{20} - 242i^{21} - 24i^{22}\big) \text{Log20}[i]}{120120}$$

$Q5 [l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$$= \frac{1}{586637251200i^4(1+i)}$$
$$\big(-1462564026 - 4175621604i - 2393881182i^2 + 936098856i^3 + 1029323505i^4 -$$
$$269969490i^5 - 3155457855i^6 - 10965619720i^7 - 24840409990i^8 - 39169479450$$
$$i^9 - 43117075896i^{10} - 32617718304i^{11} - 15653427552i^{12} - 3950822304i^{13}\big) +$$
$$\frac{1}{1113840} \big(\big(55539i^{16} + 161487i^{17} + 96156i^{18} - 36300i^{19} -$$
$$41850i^{20} - 12100i^{21} - 1200i^{22}\big) \text{Log20}[i]\big)$$

$Q5\,[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{195545750400i^4(1+i)^3}$

$\left(-52378326 - 544648104i - 1474737264i^2 - 1482208728i^3 - 339673425i^4 + \right.$
$169293852i^5 - 986805950i^6 - 4919772080i^7 - 13907512575i^8 -$
$27924902810i^9 - 41186265086i^{10} - 44878139574i^{11} -$
$35679187164i^{12} - 19940074248i^{13} - 7187499360i^{14} - 1316940768i^{15}\big) +$
$\dfrac{\left(2907i^{16} + 24567i^{17} + 31236i^{18} - 1980i^{19} - 7730i^{20} - 2420i^{21} - 240i^{22}\right) \text{Log20}[i]}{542640}$

$Q5\,[l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{3226504881600i^2(1+i)^5}$

$\left(-395405010 - 1602430830i - 2587072995i^2 - 4365455484i^3 - 22287458544i^4 - \right.$
$106150640617i^5 - 353203906775i^6 - 858227031685i^7 - 1573151525341i^8 -$
$2209262847011i^9 - 2385357186553i^{10} - 1964752656735i^{11} -$
$1207830503880i^{12} - 529925146344i^{13} - 151093627344i^{14} - 21729522672i^{15}\big) +$
$\dfrac{\left(4389i^{18} + 462i^{19} - 693i^{20} - 242i^{21} - 24i^{22}\right) \text{Log20}[i]}{1790712}$

$Q5\,[l = 6, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{172982779200(1+i)^7}$

$\left(-8040235 - 149502136i - 1309185585i^2 - 7168042261i^3 - 27467985646i^4 - \right.$
$78118674534i^5 - 170555818164i^6 - 291540810660i^7 - 394121880459i^8 -$
$422364141314i^9 - 356978343581i^{10} - 234652679361i^{11} -$
$116805148790i^{12} - 41932871636i^{13} - 9843008976i^{14} - 1164986064i^{15}\big)$

$Q5\,[l = 7, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{7495920432000(1+i)^9}$

$\left(-307185585 - 6329158038i - 61810716673i^2 - 380219937940i^3 - \right.$
$1651011744864i^4 - 5374372352406i^5 - 13591797477738i^6 - 27303788884680i^7 -$
$44158151769615i^8 - 57904519356990i^9 - 61668857296035i^{10} -$
$53153966668380i^{11} - 36728723819490i^{12} - 19996506552510i^{13} -$
$8329668868920i^{14} - 2522225138880i^{15} - 502035179040i^{16} - 50482729440i^{17}\big)$

$Q5\,[l = 0, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200}$

$\left(-191532705 - 2162303871i - 10937155164i^2 - 32469726668i^3 - 62074791510i^4 - \right.$
$78469769340i^5 - 64115427648i^6 - 30936805632i^7 - 6744333024i^8\big)$

$Q5\,[l = 1, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{32590958400}\left(-6523665 - 74822999i - 386094618i^2 - 1176361186i^3 - \right.$
$\left. 2329051445i^4 - 3093268780i^5 - 2719964912i^6 - 1466926464i^7 - 374685168i^8\right)$

$Q5\,[l = 2, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$=$

$\dfrac{1}{97772875200i^4}\left(-71058708 - 35818524i + 11519676i^2 + 33685596i^3 - 13018180i^4 - \right.$
$145633488i^5 - 819355602i^6 - 2490247178i^7 - 5055233613i^8 - $
$\left. 6866609310i^9 - 6322655232i^{10} - 3645424512i^{11} - 1124055504i^{12}\right) +$
$\dfrac{\left(1746i^{16} + 2718i^{17} + 638i^{18} - 1122i^{19} - 885i^{20} - 242i^{21} - 24i^{22}\right)\text{Log20}[i]}{120120}$

$Q5\,[l = 3, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200i^4(1+i)^2}$

$\left(-1462564026 - 4939965954i - 5211760554i^2 - 794074050i^3 + 1949698961i^4 + \right.$
$552751465i^5 - 4749881245i^6 - 19258245325i^7 - 49330168910i^8 - $
$89363386840i^9 - 116898150066i^{10} - 110093727984i^{11} - $
$\left. 72470285184i^{12} - 30829083840i^{13} - 6744333024i^{14}\right) +$
$\dfrac{1}{1113840}\left(\left(55539i^{16} + 134973i^{17} + 69716i^{18} - 36300i^{19} - \right.\right.$
$\left.\left. 41850i^{20} - 12100i^{21} - 1200i^{22}\right)\text{Log20}[i]\right)$

$Q5\,[l = 4, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400i^4(1+i)^4}$

$\left(-52378326 - 512810298i - 1606845240i^2 - 2228346120i^3 - 1268321145i^4 - \right.$
$65893191i^5 - 1203878078i^6 - 7681393930i^7 - 24456866855i^8 - $
$54870322355i^9 - 91821465856i^{10} - 116222738948i^{11} - 111103586610i^{12} - $
$\left. 78891571620i^{13} - 39995358720i^{14} - 13261873536i^{15} - 2248111008i^{16}\right) +$
$\dfrac{\left(2907i^{16} + 19893i^{17} + 22116i^{18} - 1980i^{19} - 7730i^{20} - 2420i^{21} - 240i^{22}\right)\text{Log20}[i]}{542640}$

$Q5\,[l = 5, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{3226504881600i^2(1+i)^6}$

$\left(-263603340 - 1345764420i - 2935380955i^2 - 6338324889i^3 - 31646569695i^4 - 158089532973i^5 - 569551733337i^6 - 1513818781140i^7 - 3067645003611i^8 - 4828917973110i^9 - 5952592376907i^{10} - 5741473667908i^{11} - 4289011510575i^{12} - 2425160742444i^{13} - 992658173760i^{14} - 268081865568i^{15} - 37093831632i^{16}\right) +$

$\dfrac{\left(2926i^{18} + 462i^{19} - 693i^{20} - 242i^{21} - 24i^{22}\right)\text{Log20}[i]}{1790712}$

$Q5\,[l = 6, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{172982779200(1+i)^8}$

$\left(-9450035 - 185806201i - 1727200070i^2 - 10083611318i^3 - 41418471319i^4 - 127049972864i^5 - 301431573228i^6 - 565070814600i^7 - 847396340427i^8 - 1022260491751i^9 - 991611591626i^{10} - 768256983742i^{11} - 468511351135i^{12} - 219054428018i^{13} - 74886221824i^{14} - 17013717504i^{15} - 1988713584i^{16}\right)$

$Q5\,[l = 7, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{7495920432000(1+i)^{10}}$

$\left(-352097025 - 7628413233i - 78580740727i^2 - 511650190703i^3 - 2361137097904i^4 - 8206468300770i^5 - 22281041720544i^6 - 48364475783598i^7 - 85181869507695i^8 - 122808031681755i^9 - 145522835546625i^{10} - 141697735653165i^{11} - 112849942770930i^{12} - 72785701684200i^{13} - 37375874175030i^{14} - 14854117692000i^{15} - 4349837589120i^{16} - 851705728320i^{17} - 86177588640i^{18}\right)$

$Q5\,[l = 0, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200}\left(18639803 + 218343762i + 1147525873i^2 + 3545552366i^3 + 7069053360i^4 + 9345907188i^5 + 8021366496i^6 + 4091869944i^7 + 951123888i^8\right)$

$Q5\,[l = 1, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{97772875200}\left(2068425 + 24538614i + 131060398i^2 + 413566881i^3 + 848457540i^4 + 1168092450i^5 + 1065025962i^6 + 595969884i^7 + 158520648i^8\right)$

$Q5\,[l = 2, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{97772875200 i^4}\left(23686236 + 19509336i - 4957302i^2 - 10802274i^3 - 1832376i^4 + 17050992i^5 + 97921589i^6 + 309680021i^7 + 647565942i^8 + 909221478i^9 + 860778204i^{10} + 509961444i^{11} + 158520648i^{12}\right) + $

$\dfrac{\left(-582i^{16} - 1092i^{17} - 381i^{18} + 393i^{19} + 362i^{20} + 110i^{21} + 12i^{22}\right)\operatorname{Log20}[i]}{120120}$

$Q5\,[l = 3, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200 i^4 (1+i)}$

$\left(487521342 + 1428135786i + 887562522i^2 - 308145222i^3 - 429705535i^4 - 42635005i^5 + 522818505i^6 + 1934877505i^7 + 4556181850i^8 + 7508272560i^9 + 8649322272i^{10} + 6888624876i^{11} + 3494841912i^{12} + 951123888i^{13}\right) + $

$\dfrac{1}{1113840}\left(\left(-18513i^{16} - 55206i^{17} - 35527i^{18} + 11850i^{19} + 17040i^{20} + 5500i^{21} + 600i^{22}\right)\operatorname{Log20}[i]\right)$

$Q5\,[l = 4, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{586637251200 i^4 (1+i)^3}\left(52378326 + 547729182i + 1506412908i^2 + 1555145592i^3 + 366839109i^4 - 317325099i^5 + 315196648i^6 + 2472502086i^7 + 7354085805i^8 + 15305200429i^9 + 23424626418i^{10} + 26541553644i^{11} + 22000732092i^{12} + 12867242472i^{13} + 4881039048i^{14} + 951123888i^{15}\right) + $

$\dfrac{\left(-2907i^{16} - 24738i^{17} - 32661i^{18} + 870i^{19} + 9376i^{20} + 3300i^{21} + 360i^{22}\right)\operatorname{Log20}[i]}{1627920}$

$Q5\,[l = 5, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{3226504881600 i^2 (1+i)^5}\left(131801670 + 541080540i + 854432189i^2 + 972083593i^3 + 3610031672i^4 + 17573673969i^5 + 60438171285i^6 + 151416575910i^7 + 286303919407i^8 + 415226645108i^9 + 463647476941i^{10} + 395646837630i^{11} + 252573464484i^{12} + 115455324798i^{13} + 34469799012i^{14} + 5231181384i^{15}\right) + $

$\dfrac{\left(-7315i^{18} - 1155i^{19} + 1386i^{20} + 550i^{21} + 60i^{22}\right)\operatorname{Log20}[i]}{8953560}$

Q5 $[l = 6, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{57660926400(1 + i)^7}$

$\big(406735 + 7744499i + 69483411i^2 + 389993456i^3 + 1532913100i^4 +$

$4474600286i^5 + 10033949866i^6 + 17629447284i^7 + 24517437029i^8 +$

$27056521385i^9 + 23577658409i^{10} + 16004693244i^{11} +$

$8244948046i^{12} + 3072812696i^{13} + 752260540i^{14} + 93486536i^{15}\big)$

Q5 $[l = 7, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{22487761296000(1 + i)^9}$

$\big(138850425 + 2922539655i + 29168925869i^2 + 183448437249i^3 +$

$814777813584i^4 + 2714080442478i^5 + 7027238403882i^6 + 14459886426870i^7 +$

$23967817361175i^8 + 32231190180285i^9 + 35228199089655i^{10} +$

$31189065272715i^{11} + 22161583668690i^{12} + 12425909659560i^{13} +$

$5341844125200i^{14} + 1674369266940i^{15} + 346519167480i^{16} + 36459749040i^{17}\big)$

Q5 $[l = 0, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200} \big(14379547 + 167754132i + 877639347i^2 + 2698144766i^3 +$

$5351234385i^4 + 7039470132i^5 + 6021214836i^6 + 3072140856i^7 + 718331328i^8\big)$

Q5 $[l = 1, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{65181916800} \big(1139550 + 13448616i + 71383053i^2 + 223564614i^3 +$

$454453685i^4 + 618559060i^5 + 555997988i^6 + 305715624i^7 + 79814592i^8\big)$

Q5 $[l = 2, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{195545750400i^4} \big(47372472 + 49762944i - 10032414i^2 - 21447468i^3 - 4723964i^4 +$

$29817984i^5 + 166922727i^6 + 526527562i^7 + 1087702899i^8 +$

$1509246684i^9 + 1401340668i^{10} + 810246792i^{11} + 239443776i^{12}\big) +$

$\dfrac{\big(-1164i^{16} - 2448i^{17} - 1037i^{18} + 786i^{19} + 735i^{20} + 220i^{21} + 24i^{22}\big) \text{Log20}[i]}{240240}$

$Q5\,[l = 3, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200i^4}$

$\big(487521342 + 1173354336i + 50094198i^2 - 362951820i^3 - 75391575i^4 +$

$17708460i^5 + 448249395i^6 + 1247991910i^7 + 2731396965i^8 + 3740341140i^9 +$

$3621335172i^{10} + 2110040136i^{11} + 718331328i^{12}\big) +$

$\dfrac{1}{1113840}\big(\big(-18513i^{16} - 64044i^{17} - 48747i^{18} + 11850i^{19} +$

$17535i^{20} + 5500i^{21} + 600i^{22}\big)\,\mathrm{Log20}[i]\big)$

$Q5\,[l = 4, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{195545750400i^4(1 + i)^2}\big(17459442 + 193188996i + 445777332i^2 + 259363104i^3 -$

$61798191i^4 - 52096954i^5 + 136152848i^6 + 606224520i^7 +$

$1595526020i^8 + 2953188092i^9 + 3943881471i^{10} + 3774920988i^{11} +$

$2517644172i^{12} + 1075334184i^{13} + 239443776i^{14}\big) +$

$\dfrac{\big(-969i^{16} - 9804i^{17} - 15447i^{18} + 290i^{19} + 3283i^{20} + 1100i^{21} + 120i^{22}\big)\,\mathrm{Log20}[i]}{542640}$

$Q5\,[l = 5, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{6453009763200i^2(1 + i)^4}$

$\big(395405010 + 1207025820i + 1264754712i^2 + 1105708344i^3 +$

$5677095177i^4 + 26679529826i^5 + 84233395049i^6 + 192224612976i^7 +$

$327166796033i^8 + 420063799166i^9 + 405736473351i^{10} +$

$289437377724i^{11} + 146215599948i^{12} + 47761614648i^{13} + 7901644608i^{14}\big) +$

$\dfrac{\big(-21945i^{18} - 2310i^{19} + 3003i^{20} + 1100i^{21} + 120i^{22}\big)\,\mathrm{Log20}[i]}{17907120}$

$Q5\,[l = 6, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{345965558400(1 + i)^6}$

$\big(2299430 + 41392764i + 349681041i^2 + 1839273788i^3 + 6736908246i^4 +$

$18201573180i^5 + 37465446396i^6 + 59797537344i^7 + 74540976552i^8 +$

$72435162424i^9 + 54230347485i^{10} + 30503986164i^{11} +$

$12289972996i^{12} + 3218777688i^{13} + 423631296i^{14}\big)$

$Q5[l = 7, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{7495920432000(1+i)^8}$

$\left(44037903 + 881355244i + 8337462415i^2 + 49517470782i^3 + 206809682367i^4 + 644587270524i^5 + 1552414443630i^6 + 2950283512740i^7 + 4477312544055i^8 + 5452766950620i^9 + 5322321320745i^{10} + 4130738072730i^{11} + 2507965267335i^{12} + 1157415956700i^{13} + 385818726060i^{14} + 83999703000i^{15} + 9178678080i^{16}\right)$

$Q5[l = 0, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200} \left(-2547545 - 30757909i - 166760971i^2 - 532058247i^3 - 1096713345i^4 - 1501396245i^5 - 1337537832i^6 - 710753748i^7 - 172931616i^8\right)$

$Q5[l = 1, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{195545750400} \left(-586830 - 7170326i - 39466217i^2 - 128406369i^3 - 271728975i^4 - 385978635i^5 - 363134688i^6 - 209695476i^7 - 57643872i^8\right)$

$Q5[l = 2, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{195545750400i^4} \left(-15790824 - 18052776i + 2390234i^2 + 8270850i^3 + 2863700i^4 - 4842292i^5 - 30184429i^6 - 98678637i^7 - 212466075i^8 - 307659495i^9 - 299638056i^{10} - 182473036i^{11} - 57643872i^{12}\right) + \dfrac{\left(388i^{16} + 852i^{17} + 407i^{18} - 265i^{19} - 295i^{20} - 99i^{21} - 12i^{22}\right) \text{Log20}[i]}{240240}$

$Q5[l = 3, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200i^4}$

$\left(-162507114 - 403205418i - 40578846i^2 + 134892450i^3 + 41275325i^4 + 7367745i^5 - 85009815i^6 - 225616875i^7 - 530050125i^8 - 746920305i^9 - 766068144i^{10} - 465751788i^{11} - 172931616i^{12}\right) + \dfrac{\left(6171i^{16} + 21807i^{17} + 17639i^{18} - 3525i^{19} - 6975i^{20} - 2475i^{21} - 300i^{22}\right) \text{Log20}[i]}{1113840}$

$Q5\,[l=4, k_1=0, k_2=1, k_3=1, k_4=1]$

$=$

$\frac{1}{586637251200i^4(1+i)^2}\left(-17459442 - 194216022i - 457020564i^2 - 280900620i^3 + \right.$

$61939059i^4 + 81002285i^5 - 53689740i^6 - 324894900i^7 -$

$889862050i^8 - 1703597310i^9 - 2359399347i^{10} - 2345974137i^{11} -$

$\left.1631966544i^{12} - 729947700i^{13} - 172931616i^{14}\right) +$

$\frac{\left(969i^{16} + 9861i^{17} + 16017i^{18} + 365i^{19} - 3865i^{20} - 1485i^{21} - 180i^{22}\right)\text{Log20}[i]}{1627920}$

$Q5\,[l=5, k_1=0, k_2=1, k_3=1, k_4=1]$

$= \frac{1}{6453009763200i^2(1+i)^4}$

$\left(-131801670 - 409278870i - 430862900i^2 - 247360412i^3 - 937327911i^4 - \right.$

$4677078155i^5 - 15267513905i^6 - 35868441345i^7 - 62883728523i^8 -$

$83261228259i^9 - 83051582955i^{10} - 61298018595i^{11} -$

$\left.32126226000i^{12} - 10935579732i^{13} - 1902247776i^{14}\right) +$

$\frac{\left(1463i^{18} + 231i^{19} - 231i^{20} - 99i^{21} - 12i^{22}\right)\text{Log20}[i]}{3581424}$

$Q5\,[l=6, k_1=0, k_2=1, k_3=1, k_4=1]$

$= \frac{1}{345965558400(1+i)^6}$

$\left(-372890 - 6865838i - 59355339i^2 - 319648013i^3 - 1199373722i^4 - \right.$

$3321353490i^5 - 7011508692i^6 - 11484870876i^7 - 14703719772i^8 -$

$14687958148i^9 - 11317039255i^{10} - 6561690033i^{11} -$

$\left.2731613584i^{12} - 742097668i^{13} - 101985312i^{14}\right)$

$Q5\,[l=7, k_1=0, k_2=1, k_3=1, k_4=1]$

$= \frac{1}{22487761296000(1+i)^8}$

$\left(-21337575 - 435776579i - 4208187237i^2 - 25522621329i^3 - 108894178785i^4 - \right.$

$346855421901i^5 - 854042570430i^6 - 1660051682970i^7 - 2577839843715i^8 -$

$3214054739775i^9 - 3213589882635i^{10} - 2556764501655i^{11} - 1592914077285i^{12} -$

$\left.755437654545i^{13} - 259358276400i^{14} - 58363858380i^{15} - 6629045280i^{16}\right)$

$Q5\,[l=0, k_1=1, k_2=0, k_3=0, k_4=0]$

$= \frac{1}{586637251200}$

$\left(322686000 + 3462222855i + 16583187348i^2 + 46423273468i^3 + 83285587050i^4 + \right.$

$\left.98289811620i^5 + 74647418880i^6 + 33392918304i^7 + 6744333024i^8\right)$

Q5 $[l = 1, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{32590958400} \left(12039480 + 131072255i + 639438436i^2 + 1832966226i^3 + \right.$

$\left. 3393354685i^4 + 4180493240i^5 + 3373412000i^6 + 1645703088i^7 + 374685168i^8 \right)$

Q5 $[l = 2, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{97772875200i^3} \left(-59337684 - 75261312i - 45740268i^2 + 19743612i^3 + \right.$

$285323136i^4 + 1433488056i^5 + 4147331266i^6 + 7830585159i^7 +$

$\left. 9884598570i^8 + 8301771840i^9 + 4308732144i^{10} + 1124055504i^{11} \right) +$

$\dfrac{\left(1458i^{17} + 3384i^{18} + 3066i^{19} + 1347i^{20} + 286i^{21} + 24i^{22}\right) \text{Log20}[i]}{120120}$

Q5 $[l = 3, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{586637251200i^3(1+i)^2}$

$\left(-979071786 - 4064553108i - 6461619318i^2 - 4899516216i^3 - \right.$

$400380015i^4 + 9174756150i^5 + 34479133205i^6 + 83647498990i^7 +$

$142931080160i^8 + 175299250650i^9 + 153506749704i^{10} +$

$\left. 92823657312i^{11} + 35570796192i^{12} + 6744333024i^{13} \right) +$

$\dfrac{\left(37179i^{17} + 119124i^{18} + 132300i^{19} + 64950i^{20} + 14300i^{21} + 1200i^{22}\right) \text{Log20}[i]}{1113840}$

Q5 $[l = 4, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{195545750400i^3(1+i)^4}$

$\left(-27729702 - 299459160i - 1098016920i^2 - 1955023980i^3 - \right.$

$1504631765i^4 + 2337037248i^5 + 14651314470i^6 + 44231815730i^7 +$

$94574643075i^8 + 150415327560i^9 + 180159248308i^{10} + 162040728030i^{11} +$

$\left. 107408505180i^{12} + 50249394240i^{13} + 15096399840i^{14} + 2248111008i^{15} \right) +$

$\dfrac{\left(1539i^{17} + 12084i^{18} + 20860i^{19} + 12350i^{20} + 2860i^{21} + 240i^{22}\right) \text{Log20}[i]}{542640}$

Q5 $[l = 5, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{3226504881600i(1+i)^6}$

$\left(-124864740 - 263651310i + 6059403675i^2 + 60261922032i^3 + 309912216029i^4 + \right.$

$1079013706467i^5 + 2756114615040i^6 + 5355250643425i^7 + 8061847774398i^8 +$

$9473076922221i^9 + 8674030094048i^{10} + 6117967626375i^{11} +$

$\left. 3241673867520i^{12} + 1229713139952i^{13} + 302541815664i^{14} + 37093831632i^{15} \right) +$

$\dfrac{\left(1386i^{19} + 1155i^{20} + 286i^{21} + 24i^{22}\right) \text{Log20}[i]}{1790712}$

Q5 $[l = 6, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{172982779200(1+i)^8}$

$\big(21023940 + 401308425i + 3617966604i^2 + 20462930006i^3 + 81330368179i^4 +$
$241077778196i^5 + 551869567764i^6 + 996457552176i^7 + 1436359991154i^8 +$
$1661468982711i^9 + 1540650987144i^{10} + 1136588932806i^{11} + 656567371189i^{12} +$
$288663950006i^{13} + 91802946304i^{14} + 19085873616i^{15} + 1988713584i^{16}\big)$

Q5 $[l = 7, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{7495920432000(1+i)^{10}}$

$\big(794584728 + 16763289599i + 168017491026i^2 + 1063568060127i^3 +$
$4767352125782i^4 + 16078663508574i^5 + 42315161104902i^6 +$
$88925711281758i^7 + 151422472602900i^8 + 210726821417565i^9 +$
$240576716556570i^{10} + 225172505357685i^{11} + 171880654231530i^{12} +$
$105853921884480i^{13} + 51637945263390i^{14} + 19355944597800i^{15} +$
$5289881853600i^{16} + 951234121440i^{17} + 86177588640i^{18}\big)$

Q5 $[l = 0, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200}$

$\big(-30929808 - 345309965i - 1723621991i^2 - 5037133686i^3 - 9453377610i^4 -$
$11701139208i^5 - 9353446920i^6 - 4425221448i^7 - 951123888i^8\big)$

Q5 $[l = 1, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{97772875200} \big(-3659160 - 41375455i - 209856661i^2 - 626026401i^3 -$
$1207207085i^4 - 1550472770i^5 - 1305388350i^6 - 665094468i^7 - 158520648i^8\big)$

Q5 $[l = 2, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{97772875200i^3} \big(19779228 + 30703428i + 18084906i^2 + 1677396i^3 - 31088512i^4 -$
$162967336i^5 - 490822449i^6 - 962754453i^7 - 1263846408i^8 -$
$1101753000i^9 - 592652028i^{10} - 158520648i^{11}\big) +$
$\dfrac{\big(-486i^{17} - 1266i^{18} - 1237i^{19} - 577i^{20} - 132i^{21} - 12i^{22}\big) \text{Log20}[i]}{120120}$

Q5 $[l = 3, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$=$

$\frac{1}{195545750400 i^3 (1+i)} \left(108785754 + 397737648i + 468355734i^2 + 232275540i^3 - \right.$

$731465i^4 - 308826980i^5 - 1064599525i^6 - 2384577360i^7 - 3697847450i^8 -$

$3992403120i^9 - 2936422716i^{10} - 1357460472i^{11} - 317041296i^{12} \big) +$

$\frac{\left(-4131i^{17} - 15321i^{18} - 18350i^{19} - 9330i^{20} - 2200i^{21} - 200i^{22} \right) \text{Log20}[i]}{371280}$

Q5 $[l = 4, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$=$

$\frac{1}{586637251200 i^3 (1+i)^3} \left(27729702 + 317945628i + 1037548512i^2 + 1498705572i^3 + \right.$

$949026169i^4 - 654182438i^5 - 4307904666i^6 - 12163184330i^7 -$

$24159710069i^8 - 35166742812i^9 - 37707096570i^{10} -$

$29373887976i^{11} - 15977988288i^{12} - 5539974552i^{13} - 951123888i^{14} \big) +$

$\frac{\left(-1539i^{17} - 14649i^{18} - 27590i^{19} - 16106i^{20} - 3960i^{21} - 360i^{22} \right) \text{Log20}[i]}{1627920}$

Q5 $[l = 5, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$=$

$\frac{1}{1075501627200 i (1+i)^5} \left(20810790 + 80030652i - 100729265i^2 - 2021526208i^3 - \right.$

$10411943958i^4 - 34604153660i^5 - 83418621915i^6 - 151450222220i^7 -$

$210327340487i^8 - 224110225262i^9 - 181660652525i^{10} -$

$109456751008i^{11} - 46771798590i^{12} - 12847207428i^{13} - 1743727128i^{14} \big) +$

$\frac{\left(-1155i^{19} - 847i^{20} - 220i^{21} - 20i^{22} \right) \text{Log20}[i]}{2984520}$

Q5 $[l = 6, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \frac{1}{172982779200 (1+i)^7}$

$\left(-2428860 - 44957255i - 391729618i^2 - 2133069839i^3 - 8124625314i^4 - \right.$

$22951653048i^5 - 49735350270i^6 - 84299389872i^7 - 112868874786i^8 -$

$119621101971i^9 - 99793022932i^{10} - 64575924815i^{11} -$

$31522647148i^{12} - 11031440964i^{13} - 2499085884i^{14} - 280459608i^{15} \big)$

$Q5\,[l = 7, k_1 = 1, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{22487761296000(1 + i)^9}$

$\big(-278768280 - 5720672839i - 55626479860i^2 - 340572436875i^3 - $
$1471298189832i^4 - 4762643464440i^5 - 11970989816472i^6 - 23885465468610i^7 - $
$38340274434600i^8 - 49854211426665i^9 - 52592484169500i^{10} - $
$44839305121785i^{11} - 30591545781240i^{12} - 16403186704950i^{13} - $
$6704799369840i^{14} - 1980884160900i^{15} - 381138901800i^{16} - 36459749040i^{17}\big)$

$Q5\,[l = 0, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400}\big(-18193448 - 202584655i - 1008119112i^2 - 2935035116i^3 - $
$5480710075i^4 - 6735048408i^5 - 5324228640i^6 - 2475973296i^7 - 518794848i^8\big)$

$Q5\,[l = 1, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$=$

$\dfrac{1}{21727305600}\big(-1268520 - 14381390i - 73187968i^2 - 219263044i^3 - 425112555i^4 - $
$549707620i^5 - 466670400i^6 - 240017424i^7 - 57643872i^8\big)$

$Q5\,[l = 2, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{65181916800 i^3}\big(13186152 + 18678240i + 12449304i^2 - $
$237860i^3 - 29247008i^4 - 156994824i^5 - 474328660i^6 - 942001817i^7 - $
$1252324656i^8 - 1113962400i^9 - 614780112i^{10} - 172931616i^{11}\big) + $
$\dfrac{\big(-324i^{17} - 800i^{18} - 788i^{19} - 381i^{20} - 88i^{21} - 8i^{22}\big)\,\mathrm{Log20}[i]}{80080}$

$Q5\,[l = 3, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{195545750400 i^3 (1 + i)^2}$

$\big(108785754 + 467733420i + 785893878i^2 + 653423652i^3 + 207256735i^4 - $
$436953790i^5 - 1861783605i^6 - 4715497435i^7 - 8414074790i^8 - 10801772555i^9 - $
$9929469996i^{10} - 6325632000i^{11} - 2566113552i^{12} - 518794848i^{13}\big) + $
$\dfrac{\big(-4131i^{17} - 13848i^{18} - 16700i^{19} - 9165i^{20} - 2200i^{21} - 200i^{22}\big)\,\mathrm{Log20}[i]}{371280}$

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$Q5\,[l = 4, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{65181916800\,i^3(1+i)^4}$

$\big(3081078 + 33729696i + 127351224i^2 + 239054634i^3 + 232140181i^4 -$
$16713788i^5 - 723839558i^6 - 2368508357i^7 - 5266899363i^8 - 8703646142i^9 -$
$10850029320i^{10} - 10178349001i^{11} - 7054812024i^{12} -$
$3462446304i^{13} - 1095962256i^{14} - 172931616i^{15}\big) +$

$\dfrac{\big(-171i^{17} - 1368i^{18} - 2540i^{19} - 1737i^{20} - 440i^{21} - 40i^{22}\big)\,\mathrm{Log20}[i]}{180880}$

$Q5\,[l = 5, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$=$

$\dfrac{1}{2151003254400\,i(1+i)^6}\,\big(27747720 + 124283562i - 316063618i^2 - 5502527706i^3 -$
$30776706194i^4 - 111445303953i^5 - 294188374350i^6 - 590720097895i^7 -$
$919962846924i^8 - 1119819207111i^9 - 1063879550822i^{10} - 780066127753i^{11} -$
$430718505228i^{12} - 170797087296i^{13} - 44106259824i^{14} - 5706743328i^{15}\big) +$

$\dfrac{\big(-1540i^{19} - 1617i^{20} - 440i^{21} - 40i^{22}\big)\,\mathrm{Log20}[i]}{5969040}$

$Q5\,[l = 6, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{115321852800(1+i)^8}$

$\big(-1902460 - 37240770i - 344509032i^2 - 2000647132i^3 - 8169765429i^4 -$
$24898644780i^5 - 58647407196i^6 - 109050726888i^7 - 162029911158i^8 -$
$193395625166i^9 - 185275790220i^{10} - 141424422804i^{11} - 84685684187i^{12} -$
$38686708032i^{13} - 12823761504i^{14} - 2790332400i^{15} - 305955936i^{16}\big)$

$Q5\,[l = 7, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{2498640144000(1+i)^{10}}$

$\big(-35506884 - 766305631i - 7860804826i^2 - 50951346463i^3 - 233971912383i^4 -$
$808840399796i^5 - 2183133185343i^6 - 4708106800698i^7 - 8232490597230i^8 -$
$11773391549385i^9 - 13824143814840i^{10} - 13320627963765i^{11} -$
$10480137879525i^{12} - 6661977642090i^{13} - 3360605515785i^{14} -$
$1305731851380i^{15} - 371069635200i^{16} - 69679859760i^{17} - 6629045280i^{18}\big)$

$Q5\,[l = 0, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200}\,\big(5297656 + 61232535i + 316780737i^2 + 960532586i^3 +$
$1872200625i^4 + 2408490711i^5 + 2001391980i^6 + 983868336i^7 + 219490128i^8\big)$

$Q5\,[l=1,k_1=1,k_2=0,k_3=1,k_4=1]$

$=\dfrac{1}{65181916800}\left(399480+4685110i+24684338i^2+76619634i^3+\right.$

$\left.154022645i^4+206641435i^5+182146160i^6+97380624i^7+24387792i^8\right)$

$Q5\,[l=2,k_1=1,k_2=0,k_3=1,k_4=1]$

$=$

$\dfrac{1}{195545750400i^3}\left(-13186152-22422456i-14775516i^2-3238844i^3+9870756i^4+\right.$

$55898808i^5+175084078i^6+358789863i^7+492891597i^8+$

$\left.451612140i^9+256327632i^{10}+73163376i^{11}\right)+$

$\dfrac{\left(324i^{17}+892i^{18}+942i^{19}+483i^{20}+121i^{21}+12i^{22}\right)\mathrm{Log}20[i]}{240240}$

$Q5\,[l=3,k_1=1,k_2=0,k_3=1,k_4=1]$

$=$

$\dfrac{1}{586637251200i^3(1+i)}\left(-108785754-413854056i-525442302i^2-293784120i^3-\right.$

$48911415i^4+149055060i^5+552551065i^6+1286166475i^7+2079495660i^8+$

$\left.2345314875i^9+1809495096i^{10}+881030304i^{11}+219490128i^{12}\right)+$

$\dfrac{\left(4131i^{17}+15933i^{18}+20550i^{19}+11655i^{20}+3025i^{21}+300i^{22}\right)\mathrm{Log}20[i]}{1113840}$

$Q5\,[l=4,k_1=1,k_2=0,k_3=1,k_4=1]$

$=\dfrac{1}{195545750400i^3(1+i)^3}(-3081078-35783748i-$

$120576456i^2-183942486i^3-137132177i^4-2178358i^5+232579334i^6+$

$701219695i^7+1442500961i^8+2175638018i^9+2421313830i^{10}+$

$1961929113i^{11}+1113144564i^{12}+404189280i^{13}+73163376i^{14}\big)+$

$\dfrac{\left(171i^{17}+1653i^{18}+3310i^{19}+2219i^{20}+605i^{21}+60i^{22}\right)\mathrm{Log}20[i]}{542640}$

$Q5\,[l=5,k_1=1,k_2=0,k_3=1,k_4=1]$

$=$

$\dfrac{1}{6453009763200i(1+i)^5}\left(-41621580-186013074i-135660330i^2+1684093086i^3+\right.$

$10069469228i^4+34886997505i^5+86697573320i^6+162203058215i^7+$

$232340788174i^8+255644317907i^9+214283432220i^{10}+$

$\left.133750162161i^{11}+59346753840i^{12}+16985159136i^{13}+2414391408i^{14}\right)+$

$\dfrac{\left(2310i^{19}+2079i^{20}+605i^{21}+60i^{22}\right)\mathrm{Log}20[i]}{17907120}$

Q5 $[l = 6, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{345965558400(1+i)^7}$

$\big(726740 + 13767530i + 122838492i^2 + 685277090i^3 + 2675527049i^4 +$

$7751921796i^5 + 17238945360i^6 + 30005596128i^7 + 41285419290i^8 +$

$45001964266i^9 + 38649912724i^{10} + 25779333570i^{11} +$

$12991831267i^{12} + 4704191380i^{13} + 1106148384i^{14} + 129442896i^{15}\big)$

Q5 $[l = 7, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{7495920432000(1+i)^9} \big(13804140 + 289256807i + 2873086132i^2 + 17975117023i^3 +$

$79383032319i^4 + 262793944314i^5 + 675803842827i^6 + 1380195376350i^7 +$

$2268742503270i^8 + 3022610281245i^9 + 3268978245390i^{10} +$

$2859300465765i^{11} + 2003050703805i^{12} + 1104073726500i^{13} +$

$464621828265i^{14} + 141628536120i^{15} + 28202861280i^{16} + 2804596080i^{17}\big)$

Q5 $[l = 0, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200} \big(4171440 + 48110335i + 248320982i^2 + 751200827i^3 +$

$1461097530i^4 + 1876990335i^5 + 1560109380i^6 + 769389876i^7 + 172931616i^8\big)$

Q5 $[l = 1, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{195545750400} \big(1003280 + 11721250i + 61475204i^2 + 189785869i^3 + 379032710i^4 +$

$504522865i^5 + 440488020i^6 + 232858452i^7 + 57643872i^8\big)$

Q5 $[l = 2, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{195545750400i^3} \big(-13186152 - 24213168i - 15128946i^2 - 3432576i^3 + 8592556i^4 +$

$48264608i^5 + 150565129i^6 + 305819478i^7 + 416061525i^8 +$

$375720060i^9 + 209253612i^{10} + 57643872i^{11}\big) +$

$\dfrac{\big(324i^{17} + 936i^{18} + 997i^{19} + 494i^{20} + 121i^{21} + 12i^{22}\big) \text{Log20}[i]}{240240}$

Q5 $[l = 3, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200i^3} \left(-108785754 - 343858284i - 244719090i^2 - \right.$

$61148640i^3 + 8850765i^4 + 123832170i^5 + 365517295i^6 + 767817930i^7 +$

$1046428515i^8 + 977197740i^9 + 556946316i^{10} + 172931616i^{11}) +$

$\dfrac{\left(4131i^{17} + 17406i^{18} + 23025i^{19} + 12150i^{20} + 3025i^{21} + 300i^{22}\right) \text{Log20}[i]}{1113840}$

Q5 $[l = 4, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200i^3(1 + i)^2}$

$\left(-9243234 - 112144032i - 319531212i^2 - 337319164i^3 - 133414645i^4 + \right.$

$103505220i^5 + 527083700i^6 + 1374495650i^7 + 2513156910i^8 + 3303810060i^9 +$

$3103175931i^{10} + 2016771948i^{11} + 831995028i^{12} + 172931616i^{13}) +$

$\dfrac{\left(513i^{17} + 5738i^{18} + 12295i^{19} + 7130i^{20} + 1815i^{21} + 180i^{22}\right) \text{Log20}[i]}{1627920}$

Q5 $[l = 5, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$=$

$\dfrac{1}{6453009763200i(1 + i)^4} \left(-62432370 - 210943980i - 81262740i^2 + 1509830556i^3 + \right.$

$7753516355i^4 + 24396366770i^5 + 55157756775i^6 + 92849649200i^7 +$

$117683273279i^8 + 111923907810i^9 + 78330780825i^{10} +$

$38600715780i^{11} + 12177481140i^{12} + 1902247776i^{13}) +$

$\dfrac{\left(693i^{19} + 462i^{20} + 121i^{21} + 12i^{22}\right) \text{Log20}[i]}{3581424}$

Q5 $[l = 6, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{345965558400(1 + i)^6}$

$\left(686280 + 12290390i + 103242832i^2 + 539678399i^3 + 1963201032i^4 + \right.$

$5263731090i^5 + 10742317440i^6 + 16980495108i^7 + 20934558876i^8 +$

$20084104068i^9 + 14809772680i^{10} + 8176888355i^{11} +$

$3216667852i^{12} + 815080164i^{13} + 101985312i^{14})$

Q5 $[l = 7, k_1 = 1, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{22487761296000(1 + i)^8}$

$\left(39469864 + 786348913i + 7402199322i^2 + 43728523029i^3 + 181572243966i^4 + \right.$

$562336753671i^5 + 1344891807840i^6 + 2536257555930i^7 + 3816152271540i^8 +$

$4603174482885i^9 + 4444486356750i^{10} + 3406576595355i^{11} + 2038080010050i^{12} +$

$923872771395i^{13} + 301006884780i^{14} + 63523744620i^{15} + 6629045280i^{16})$

$Q5\,[l=0, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{586637251200}\left(-722176 - 8606325i - 45950814i^2 - 143954057i^3 - \right.$
$290274780i^4 - 386961201i^5 - 333965850i^6 - 171036252i^7 - 39907296i^8)$

$Q5\,[l=1, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{65181916800}\left(-56320 - 680370i - 3694796i^2 - 11828453i^3 - \right.$
$24538500i^4 - 33992805i^5 - 30953090i^6 - 17104788i^7 - 4434144i^8)$

$Q5\,[l=2, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{195545750400i^3}\left(4395384 + 8722224i + 6093990i^2 + \right.$
$1770608i^3 - 1310820i^4 - 8553048i^5 - 27650467i^6 - 58394220i^7 - $
$82739547i^8 - 78091710i^9 - 45616644i^{10} - 13302432i^{11}) + $
$\dfrac{\left(-108i^{17} - 328i^{18} - 375i^{19} - 204i^{20} - 55i^{21} - 6i^{22}\right)\mathrm{Log20}[i]}{240240}$

$Q5\,[l=3, k_1=1, k_2=1, k_3=1, k_4=1]$
$=$

$\dfrac{1}{586637251200i^3}\left(36261918 + 119991564i + 96985350i^2 + 28985040i^3 + 1657425i^4 - \right.$
$22284570i^5 - 65676325i^6 - 145275900i^7 - 204963165i^8 - $
$201057810i^9 - 119756772i^{10} - 39907296i^{11}) + $
$\dfrac{\left(-1377i^{17} - 6006i^{18} - 8475i^{19} - 4980i^{20} - 1375i^{21} - 150i^{22}\right)\mathrm{Log20}[i]}{1113840}$

$Q5\,[l=4, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{195545750400i^3(1+i)^2}$

$\left(1027026 + 12612600i + 37249212i^2 + 42182504i^3 + 20289997i^4 - \right.$
$2630264i^5 - 30719260i^6 - 83603960i^7 - 157945766i^8 - 214915992i^9 - $
$209278635i^{10} - 141386790i^{11} - 60826068i^{12} - 13302432i^{13}) + $
$\dfrac{\left(-57i^{17} - 646i^{18} - 1455i^{19} - 964i^{20} - 275i^{21} - 30i^{22}\right)\mathrm{Log20}[i]}{542640}$

$Q5\,[l=5, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{6453009763200i(1+i)^4}$

$\left(20810790 + 75624744i + 75926916i^2 - 208047528i^3 - 1326531713i^4 - 4344780872\right.$
$i^5 - 10106747673i^6 - 17504167142i^7 - 22846213181i^8 - 22398749868i^9 - $
$16181127567i^{10} - 8245653174i^{11} - 2697195996i^{12} - 438980256i^{13}) + $
$\dfrac{\left(-1155i^{19} - 924i^{20} - 275i^{21} - 30i^{22}\right)\mathrm{Log20}[i]}{17907120}$

Q5 $[l = 6, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{345965558400(1+i)^6}$

$\left(-109760 - 2009490i - 17264184i^2 - 92338181i^3 - 343852002i^4 - 944210070i^5 - \right.$

$1974504000i^6 - 3199820076i^7 - 4046732424i^8 - 3985128028i^9 -$

$\left. 3018761040i^{10} - 1713968625i^{11} - 694358914i^{12} - 181594476i^{13} - 23535072i^{14}\right)$

Q5 $[l = 7, k_1 = 1, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{7495920432000(1+i)^8}$

$\left(-2096192 - 42596281i - 409115518i^2 - 2466709197i^3 - 10457092548i^4 - \right.$

$33075613131i^5 - 80814991830i^6 - 155753215770i^7 - 239584946400i^8 -$

$295557784005i^9 - 291969364830i^{10} - 229075378035i^{11} - 140378602500i^{12} -$

$\left. 65236808655i^{13} - 21818304390i^{14} - 4735987500i^{15} - 509926560i^{16}\right)$

Case 6: $i_1 = i_3 = i$, $i_2 = i_4 = i + 1$

Q6 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{97772875200}$

$\left(65113867 + 834389234i + 4879525674i^2 + 17164677656i^3 + 40234813060i^4 + \right.$

$\left. 65584442592i^5 + 71728992432i^6 + 46630109472i^7 + 13488666048i^8\right)$

Q6 $[l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{2715913200}\left(879840 + 11316983i + 66517724i^2 + 235659886i^3 + \right.$

$\left. 558246885i^4 + 925217160i^5 + 1086555204i^6 + 888361112i^7 + 374685168i^8\right)$

Q6 $[l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{16295479200i^6}\left(734029128 + 205392096i + 40948614i^2 - \right.$

$149167648i^3 + 127933106i^4 - 119541744i^5 + 148175431i^6 -$

$115357120i^7 + 408247386i^8 + 642669332i^9 + 2200572742i^{10} +$

$3043709712i^{11} + 4193643368i^{12} + 2888648432i^{13} + \left. 2248111008i^{14}\right) +$

$\dfrac{1}{20020}\left(\left(-18036i^{14} - 24032i^{15} - 6263i^{16} + 2556i^{17} + 778i^{18} - \right.\right.$

$\left.\left. 460i^{19} - 354i^{20} - 88i^{21} - 8i^{22}\right) \text{Log20}[i]\right)$

Q6 $[l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{97772875200 i^6 (1+i)^2}$

$\big(21998896920 + 69727497840 i + 69422770494 i^2 + 18460087800 i^3 - 5120309964 i^4 - 1378984992 i^5 + 771050273 i^6 + 740895680 i^7 + 1381243615 i^8 + 5434122890 i^9 + 15532280530 i^{10} + 32329771040 i^{11} + 49665654884 i^{12} + 57033388320 i^{13} + 48720839376 i^{14} + 29660113248 i^{15} + 13488666048 i^{16}\big) +$

$\dfrac{1}{185640} \big(\big(-835380 i^{14} - 1856400 i^{15} - 872661 i^{16} + 130842 i^{17} + 69638 i^{18} - 13400 i^{19} - 16740 i^{20} - 4400 i^{21} - 400 i^{22}\big) \mathrm{Log20}[i]\big)$

Q6 $[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{32590958400 i^6 (1+i)^4}$

$\big(1047566520 + 10071341280 i + 30553717194 i^2 + 41328547260 i^3 + 25323764466 i^4 + 4440740304 i^5 - 1387466301 i^6 - 127684770 i^7 + 617390944 i^8 + 2083335192 i^9 + 6713782623 i^{10} + 16624025402 i^{11} + 31250977242 i^{12} + 45253599192 i^{13} + 50719388044 i^{14} + 43873490976 i^{15} + 28765640976 i^{16} + 13996111968 i^{17} + 4496222016 i^{18}\big) +$

$\dfrac{1}{90440} \big(\big(-58140 i^{14} - 387600 i^{15} - 384693 i^{16} + 19722 i^{17} + 21318 i^{18} - 120 i^{19} - 3092 i^{20} - 880 i^{21} - 80 i^{22}\big) \mathrm{Log20}[i]\big)$

Q6 $[l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{537750813600 i^4 (1+i)^6}$

$\big(6721885170 + 33255642420 i + 65579423910 i^2 + 63875251440 i^3 + 29645173961 i^4 + 4445597902 i^5 + 5312172267 i^6 + 36298828640 i^7 + 141319822969 i^8 + 407247653250 i^9 + 903350470249 i^{10} + 1572572513468 i^{11} + 2171726524440 i^{12} + 2388051489736 i^{13} + 2085127017446 i^{14} + 1431465287472 i^{15} + 758395609752 i^{16} + 298741072080 i^{17} + 74187663264 i^{18}\big) +$

$\dfrac{\big(-373065 i^{16} + 14630 i^{18} + 1540 i^{19} - 1386 i^{20} - 440 i^{21} - 40 i^{22}\big) \mathrm{Log20}[i]}{1492260}$

Q6 $[l = 6, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0]$

$= \dfrac{1}{14415231600 (1+i)^8}$

$\big(861525 + 17882207 i + 176008612 i^2 + 1091708558 i^3 + 4782515267 i^4 + 15715810198 i^5 + 40152193082 i^6 + 81560357688 i^7 + 133542600207 i^8 + 177589504653 i^9 + 192299352982 i^{10} + 169204319558 i^{11} + 120156760057 i^{12} + 67999517848 i^{13} + 30003264572 i^{14} + 9825833128 i^{15} + 1988713584 i^{16}\big)$

$Q6\left[l = 7, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 0\right]$

$= \dfrac{1}{1249320072000(1+i)^{10}}$

$\left(62785863 + 1427494320i + 15466465337i^2 + 106189463334i^3 + 518186510940i^4 +\right.$

$1910524957832i^5 + 5522384120274i^6 + 12814898587644i^7 + 24246575436225i^8 +$

$37773476840520i^9 + 48717855351195i^{10} + 52110955740090i^{11} +$

$46154648186370i^{12} + 33678330490560i^{13} + 20063643662220i^{14} +$

$\left. 9617916289120i^{15} + 3617744109680i^{16} + 1009099493920i^{17} + 172355177280i^{18}\right)$

$Q6\left[l = 0, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1\right]$

$= \dfrac{1}{293318625600}$

$\left(-19397105 - 256633419i - 1550503194i^2 - 5638383356i^3 - 13672438665i^4 -\right.$

$23076427770i^5 - 26364210912i^6 - 18208215432i^7 - 5706743328i^8\big)$

$Q6\left[l = 1, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1\right]$

$=$

$\dfrac{1}{32590958400}\left(-1184595 - 15680442i - 94839766i^2 - 345630964i^3 - 841616685i^4 -\right.$

$1432054890i^5 - 1723370376i^6 - 1440158808i^7 - 634082592i^8\big)$

$Q6\left[l = 2, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1\right]$

$= \dfrac{1}{97772875200i^6}(-1468058256 - 899811360i +$

$106917930i^2 + 143496304i^3 - 53155788i^4 + 21269304i^5 - 65752025i^6 +$

$32823192i^7 - 260793258i^8 - 579511876i^9 - 1744355667i^{10} -$

$2632827150i^{11} - 3522389936i^{12} - 2571547704i^{13} - 1902247776i^{14}) +$

$\dfrac{1}{120120}\left(\left(36072i^{14} + 60080i^{15} + 20535i^{16} - 6228i^{17} - 2474i^{18} +\right.\right.$

$948i^{19} + 885i^{20} + 242i^{21} + 24i^{22}\big) \operatorname{Log20}[i])$

$Q6\left[l = 3, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1\right]$

$= \dfrac{1}{293318625600i^6(1+i)}$

$\left(-21998896920 - 59950210320i - 33272536374i^2 + 3969615804i^3 +\right.$

$2843734740i^4 - 571237128i^5 - 247761465i^6 - 555798810i^7 - 93443955i^8 -$

$2296053670i^9 - 4410336625i^{10} - 10068346335i^{11} - 12264908994i^{12} -$

$14002577136i^{13} - 8174600280i^{14} - 5706743328i^{15}\big) +$

$\dfrac{1}{556920}\left(\left(835380i^{14} + 2320500i^{15} + 1336761i^{16} - 161487i^{17} -\right.\right.$

$104418i^{18} + 12000i^{19} + 20925i^{20} + 6050i^{21} + 600i^{22}\big) \operatorname{Log20}[i])$

$Q6\,[l = 4, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{97772875200 i^6 (1+i)^3}$

$(-1047566520 - 10769718960 i - 28421827434 i^2 - 28175563416 i^3 - 8497018530 i^4 + 1544118576 i^5 + 494844753 i^6 - 164406276 i^7 - 270090140 i^8 - 752830310 i^9 - 2333349900 i^{10} - 5401008905 i^{11} - 9371330039 i^{12} - 12302556981 i^{13} - 12205441350 i^{14} - 9065475624 i^{15} - 4780433592 i^{16} - 1902247776 i^{17}) +$

$\dfrac{1}{271320} \left(\left(58140 i^{14} + 484500 i^{15} + 578493 i^{16} - 24567 i^{17} - 31578 i^{18} - 720 i^{19} + 3865 i^{20} + 1210 i^{21} + 120 i^{22} \right) \mathrm{Log20}[i] \right)$

$Q6\,[l = 5, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{3226504881600 i^4 (1+i)^5}$

$(-20165655510 - 79601271750 i - 117136999980 i^2 - 74488754340 i^3 - 14350477635 i^4 + 2638610133 i^5 - 4736699232 i^6 - 28712540528 i^7 - 105238116880 i^8 - 286741378670 i^9 - 596420758538 i^{10} - 962690060728 i^{11} - 1215231908627 i^{12} - 1198359527805 i^{13} - 914914569030 i^{14} - 529549011552 i^{15} - 225588013992 i^{16} - 62774176608 i^{17}) +$

$\dfrac{\left(223839 i^{16} - 8778 i^{18} - 924 i^{19} + 693 i^{20} + 242 i^{21} + 24 i^{22} \right) \mathrm{Log20}[i]}{1790712}$

$Q6\,[l = 6, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{57660926400 (1+i)^7}$

$(-519435 - 10457251 i - 99519655 i^2 - 594663469 i^3 - 2498783162 i^4 - 7835449252 i^5 - 18982932984 i^6 - 36283967400 i^7 - 55370574831 i^8 - 67804326623 i^9 - 66571579063 i^{10} - 52055541821 i^{11} - 31987434230 i^{12} - 15104464504 i^{13} - 5243744792 i^{14} - 1121838432 i^{15})$

$Q6\,[l = 7, k_1 = 0, k_2 = 0, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{3747960216000 (1+i)^9}$

$(-29054865 - 642673584 i - 6757287853 i^2 - 44891669974 i^3 - 211254199023 i^4 - 748143841467 i^5 - 2067447486756 i^6 - 4561035751800 i^7 - 8148898499685 i^8 - 11889034812150 i^9 - 14214383520975 i^{10} - 13916005316430 i^{11} - 11100621540795 i^{12} - 7145748235125 i^{13} - 3654838325910 i^{14} - 1447482406640 i^{15} - 419640140040 i^{16} - 72919498080 i^{17})$

Q6 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{293318625600}$

$\left(51719031 + 645213699i + 3646264824i^2 + 12257493916i^3 + 26968569315i^4 + \right.$
$\left. 39956923278i^5 + 38732604432i^6 + 22198945032i^7 + 5706743328i^8\right)$

Q6 $[l = 1, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$=$

$\dfrac{1}{32590958400}\left(2921270 + 36845432i + 211323196i^2 + 725377884i^3 + 1646730855i^4 + \right.$
$\left. 2568207390i^5 + 2742267416i^6 + 1883573208i^7 + 634082592i^8\right)$

Q6 $[l = 2, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{97772875200i^5}$

$\left(-404375328 - 251719272i - 56407428i^2 + 115585512i^3 - 4990104i^4 + \right.$
$66983812i^5 + 11915790i^6 + 449132340i^7 + 1270725644i^8 + 3153014337i^9 +$
$\left. 4802856138i^{10} + 5512974336i^{11} + 3901790904i^{12} + 1902247776i^{13}\right) +$
$\dfrac{1}{120120}\left(\left(9936i^{15} + 16644i^{16} + 7866i^{17} - 1364i^{18} - 2892i^{19} - \right.\right.$
$\left.\left. 1347i^{20} - 286i^{21} - 24i^{22}\right) \text{Log20}[i]\right)$

Q6 $[l = 3, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{293318625600i^5(1+i)^2}$

$\left(-5076668520 - 17553525066i - 20645405550i^2 - 8505506394i^3 + 1222823448i^4 + \right.$
$2365167833i^5 + 1164088135i^6 + 1270097615i^7 + 4488204545i^8 +$
$12609886495i^9 + 25533336680i^{10} + 37932247539i^{11} + 41539720710i^{12} +$
$\left. 32932069656i^{13} + 17872073208i^{14} + 5706743328i^{15}\right) +$
$\dfrac{1}{556920}\left(\left(192780i^{15} + 483939i^{16} + 324387i^{17} + 14168i^{18} - \right.\right.$
$\left.\left. 60000i^{19} - 32475i^{20} - 7150i^{21} - 600i^{22}\right) \text{Log20}[i]\right)$

Q6 $[l = 4, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{97772875200i^5(1+i)^4}$

$\left(-209513304 - 2066646582i - 6615542934i^2 - 9792662880i^3 - 7059362310i^4 - \right.$
$1863395079i^5 + 595728523i^6 + 896812446i^7 + 1856170530i^8 + 5595213260i^9 +$
$13579588701i^{10} + 24992733918i^{11} + 35221911196i^{12} + 38096984265i^{13} +$
$\left. 31318869450i^{14} + 19025252976i^{15} + 8012924568i^{16} + 1902247776i^{17}\right) +$
$\dfrac{1}{271320}\left(\left(11628i^{15} + 80427i^{16} + 96387i^{17} + 15048i^{18} - \right.\right.$
$\left.\left. 8720i^{19} - 6175i^{20} - 1430i^{21} - 120i^{22}\right) \text{Log20}[i]\right)$

Q6 $[l = 5, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{3226504881600i^3(1+i)^6}$

$(-2372430060 - 12264492240i - 25763758020i^2 - 27593459972i^3 -$
$13870461930i^4 + 8467992144i^5 + 63197995830i^6 + 239000249253i^7 +$
$678612821562i^8 + 1482726761295i^9 + 2535429092856i^{10} +$
$3425393015055i^{11} + 3662990694352i^{12} + 3081661272393i^{13} +$
$2006838091170i^{14} + 978669899064i^{15} + 332260216200i^{16} + 62774176608i^{17}) +$
$\dfrac{(26334i^{17} + 5852i^{18} - 924i^{19} - 1155i^{20} - 286i^{21} - 24i^{22})\,\mathrm{Log20}[i]}{1790712}$

Q6 $[l = 6, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{172982779200(1+i)^8}$

$(3026030 + 62405668i + 609877748i^2 + 3753008852i^3 + 16296241873i^4 +$
$53019732842i^5 + 133930929948i^6 + 268516596192i^7 + 432977153628i^8 +$
$565358410672i^9 + 598607041208i^{10} + 511881220612i^{11} + 349854770563i^{12} +$
$187402802942i^{13} + 75849733408i^{14} + 21450256872i^{15} + 3365515296i^{16})$

Q6 $[l = 7, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{3747960216000(1+i)^{10}}$

$(55255851 + 1249209845i + 13451642325i^2 + 91735080639i^3 + 444341912153i^4 +$
$1624874117898i^5 + 4653999309909i^6 + 10689661785216i^7 + 19992015978075i^8 +$
$30733230087735i^9 + 39026807820705i^{10} + 40979026976265i^{11} +$
$35479053872985i^{12} + 25146766937160i^{13} + 14405118460785i^{14} +$
$6525964221090i^{15} + 2249017720680i^{16} + 543552294120i^{17} + 72919498080i^{18})$

Q6 $[l = 0, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{293318625600}\left(-5123573 - 66043718i - 386010233i^2 - 1343658822i^3 - \right.$
$\left. 3066280515i^4 - 4725952992i^5 - 4798367844i^6 - 2913410904i^7 - 804797136i^8\right)$

Q6 $[l = 1, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{97772875200}\left(-976590 - 12678937i - 74857636i^2 - 264479754i^3 - \right.$
$\left. 617781675i^4 - 990732960i^5 - 1086989316i^6 - 767285208i^7 - 268265712i^8\right)$

Q6 $[l = 2, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{97772875200 i^5}$

$\big(134791776 + 128511432 i + 16658334 i^2 - 29920996 i^3 - 15135960 i^4 - 8504944 i^5 - 5211539 i^6 - 54337070 i^7 - 172302042 i^8 - 424031835 i^9 - 671618688 i^{10} - 775537212 i^{11} - 563433448 i^{12} - 268265712 i^{13}\big) +$

$\dfrac{1}{120120} \big(\big(-3312 i^{15} - 6644 i^{16} - 3723 i^{17} + 302 i^{18} + 1150 i^{19} + 577 i^{20} + 132 i^{21} + 12 i^{22}\big) \mathrm{Log20}[i]\big)$

Q6 $[l = 3, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{293318625600 i^5 (1+i)}$

$\big(1692222840 + 5099075982 i + 3882495078 i^2 + 317447130 i^3 - 639102156 i^4 - 340980115 i^5 - 120111775 i^6 - 116104395 i^7 - 522622485 i^8 - 1282848225 i^9 - 2454077715 i^{10} - 3174077148 i^{11} - 3074043972 i^{12} - 1883542200 i^{13} - 804797136 i^{14}\big) +$

$\dfrac{1}{556920} \big(\big(-64260 i^{15} - 197013 i^{16} - 154044 i^{17} - 12841 i^{18} + 24450 i^{19} + 13995 i^{20} + 3300 i^{21} + 300 i^{22}\big) \mathrm{Log20}[i]\big)$

Q6 $[l = 4, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{293318625600 i^5 (1+i)^3}$

$\big(209513304 + 2206322118 i + 6224083866 i^2 + 7056293244 i^3 + 3038441406 i^4 - 130677729 i^5 - 528568157 i^6 - 343297016 i^7 - 644423742 i^8 - 1900965710 i^9 - 4313927534 i^{10} - 7297499151 i^{11} - 9270777483 i^{12} - 8796274884 i^{13} - 6082990524 i^{14} - 2881581192 i^{15} - 804797136 i^{16}\big) +$

$\dfrac{1}{813960} \big(\big(-11628 i^{15} - 99807 i^{16} - 139992 i^{17} - 23883 i^{18} + 11230 i^{19} + 8053 i^{20} + 1980 i^{21} + 180 i^{22}\big) \mathrm{Log20}[i]\big)$

Q6 $[l = 5, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{3226504881600 i^3 (1+i)^5}$

$\big(1186215030 + 4946031090 i + 7935847920 i^2 + 5891717728 i^3 + 1530250631 i^4 - 1736810279 i^5 - 8225051126 i^6 - 29069714215 i^7 - 77925174134 i^8 - 159267782091 i^9 - 251713745646 i^{10} - 309429789669 i^{11} - 294747812535 i^{12} - 214314867492 i^{13} - 115147428924 i^{14} - 42675822024 i^{15} - 8852768496 i^{16}\big) +$

$\dfrac{\big(-65835 i^{17} - 14630 i^{18} + 2310 i^{19} + 2541 i^{20} + 660 i^{21} + 60 i^{22}\big) \mathrm{Log20}[i]}{8953560}$

$\mathrm{Q6}\,[l = 6, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{172982779200(1 + i)^7}$

$\left(-449330 - 8979811i - 84768005i^2 - 501954689i^3 - 2087902582i^4 - \right.$
$6472158632i^5 - 15474894144i^6 - 29129771400i^7 - 43656347196i^8 -$
$52300344943i^9 - 49955447333i^{10} - 37668986161i^{11} -$
$\left. 21984220180i^{12} - 9570899564i^{13} - 2876568232i^{14} - 474623952i^{15} \right)$

$\mathrm{Q6}\,[l = 7, k_1 = 0, k_2 = 0, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{11243880648000(1 + i)^9}$

$\left(-25186035 - 553517953i - 5779014721i^2 - 38096770941i^3 - \right.$
$177755030409i^4 - 623575580115i^5 - 1705071335274i^6 - 3716986767990i^7 -$
$6551226544695i^8 - 9409017312405i^9 - 11042727420615i^{10} -$
$10570746774435i^{11} - 8196711661125i^{12} - 5081108964495i^{13} -$
$\left. 2461857390780i^{14} - 895692688740i^{15} - 225235096440i^{16} - 30850556880i^{17} \right)$

$\mathrm{Q6}\,[l = 0, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200}$

$\left(5407948 + 73454136i + 455730246i^2 + 1702248964i^3 + 4240644675i^4 + \right.$
$\left. 7354831068i^5 + 8679092688i^6 + 6258608208i^7 + 2075179392i^8 \right)$

$\mathrm{Q6}\,[l = 1, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{65181916800}\left(354285 + 4810688i + 29845774i^2 + 111538196i^3 + \right.$
$\left. 278336415i^4 + 484808940i^5 + 596144304i^6 + 507647472i^7 + 230575488i^8 \right)$

$\mathrm{Q6}\,[l = 2, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{195545750400i^6}$

$\left(978705504 + 925892352i - 88505298i^2 - 106806728i^3 + 11061792i^4 + 12114144 \right.$
$i^5 + 19408993i^6 - 2823696i^7 + 78077010i^8 + 206011244i^9 + 595438473i^{10} +$
$\left. 948214836i^{11} + 1263229744i^{12} + 959682096i^{13} + 691726464i^{14} \right) +$
$\dfrac{1}{240240}\left(\left(-24048i^{14} - 48064i^{15} - 21699i^{16} + 4896i^{17} + 2506i^{18} - \right.\right.$
$\left.\left. 612i^{19} - 735i^{20} - 220i^{21} - 24i^{22}\right) \mathrm{Log20}[i]\right)$

Q6 $[l = 3, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{586637251200i^6} \left(14665931280 + 33448615200i + 525856716i^2 - 3877037472i^3 + 1312420032i^4 - 1177046640i^5 + 1641517290i^6 - 1489164600i^7 + 1661978670i^8 - 1000228300i^9 + 2732076975i^{10} + 792253260i^{11} + 3952264176i^{12} + 1189265328i^{13} + 2075179392i^{14}\right) +$
$\dfrac{1}{1113840} \left(\left(-556920i^{14} - 1856400i^{15} - 1355274i^{16} + 128088i^{17} + 103002i^{18} - 5700i^{19} - 17535i^{20} - 5500i^{21} - 600i^{22}\right) \text{Log20}[i]\right)$

Q6 $[l = 4, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{195545750400i^6(1+i)^2}$
$\left(698377680 + 7645397760i + 17061039996i^2 + 9573972408i^3 - 876743868i^4 - 580515936i^5 + 59642466i^6 + 53922844i^7 + 103212652i^8 + 173193480i^9 + 684062155i^{10} + 1310983618i^{11} + 2246470377i^{12} + 2468322756i^{13} + 2309057232i^{14} + 1216614384i^{15} + 691726464i^{16}\right) +$
$\dfrac{1}{542640} \left(\left(-38760i^{14} - 387600i^{15} - 579462i^{16} + 19608i^{17} + 31122i^{18} + 1420i^{19} - 3283i^{20} - 1100i^{21} - 120i^{22}\right) \text{Log20}[i]\right)$

Q6 $[l = 5, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{6453009763200i^4(1+i)^4}$
$\left(20165655510 + 59435616240i + 57701383740i^2 + 16787370600i^3 - 2468101857i^4 - 616329300i^5 + 1832487288i^6 + 8654320264i^7 + 30092128186i^8 + 77288252184i^9 + 150162537448i^{10} + 223198003864i^{11} + 255192941949i^{12} + 222049659876i^{13} + 145000431312i^{14} + 67214630736i^{15} + 22826973312i^{16}\right) +$
$\dfrac{\left(-1119195i^{16} + 43890i^{18} + 4620i^{19} - 3003i^{20} - 1100i^{21} - 120i^{22}\right) \text{Log20}[i]}{17907120}$

Q6 $[l = 6, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{115321852800(1+i)^6}$
$\left(178465 + 3481254i + 31996221i^2 + 183926940i^3 + 740056248i^4 + 2209564560i^5 + 5061594636i^6 + 9068422704i^7 + 12828052545i^8 + 14352642942i^9 + 12631137585i^{10} + 8626542564i^{11} + 4465601616i^{12} + 1684897200i^{13} + 407941248i^{14}\right)$

$\mathrm{Q6}\,[l = 7, k_1 = 0, k_2 = 1, k_3 = 0, k_4 = 1]$

$= \dfrac{1}{7495920432000(1+i)^8}$

$\big(10078488 + 216681752i + 2208588854i^2 + 14180388468i^3 + 64260892803i^4 +$

$218220822756i^5 + 575307356640i^6 + 1203366013440i^7 + 2023039485270i^8 +$

$2751175261560i^9 + 3029578260390i^{10} + 2690336679540i^{11} + 1908184615845i^{12} +$

$1063635144900i^{13} + 454001642320i^{14} + 140959034640i^{15} + 26516181120i^{16}\big)$

$\mathrm{Q6}\,[l = 0, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{586637251200}\big(1424878 + 18866432i + 113329882i^2 + 405693118i^3 + 952952790i^4 +$

$1514273229i^5 + 1591489476i^6 + 1007240616i^7 + 292653504i^8\big)$

$\mathrm{Q6}\,[l = 1, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{195545750400}\big(290180 + 3865153i + 23414174i^2 + 84869106i^3 +$

$203310450i^4 + 334172475i^5 + 375425484i^6 + 271172712i^7 + 97551168i^8\big)$

$\mathrm{Q6}\,[l = 2, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{195545750400i^5}$

$\big(-89861184 - 115410960i - 19565742i^2 + 21299964i^3 + 14582400i^4 +$

$5066208i^5 + 2408159i^6 + 17317654i^7 + 58470458i^8 + 145377930i^9 +$

$237389439i^{10} + 277998348i^{11} + 206598552i^{12} + 97551168i^{13}\big) +$

$\dfrac{1}{240240}\big(\big(2208i^{15} + 5160i^{16} + 3459i^{17} - 18i^{18} - 910i^{19} - 494i^{20} - 121i^{21} - 12i^{22}\big)$

$\mathrm{Log20}[i]\big)$

$\mathrm{Q6}\,[l = 3, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200i^5}$

$\big(-1128148560 - 2897984628i - 776816964i^2 + 355362084i^3 + 154539000i^4 +$

$155003170i^5 - 73127670i^6 + 124422210i^7 + 48638150i^8 + 413703150i^9 +$

$464920785i^{10} + 714645252i^{11} + 426073176i^{12} + 292653504i^{13}\big) +$

$\dfrac{1}{1113840}\big(\big(42840i^{15} + 155142i^{16} + 145206i^{17} + 17374i^{18} -$

$19950i^{19} - 12150i^{20} - 3025i^{21} - 300i^{22}\big)\mathrm{Log20}[i]\big)$

Q6 $[l = 4, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{586637251200 i^5 (1+i)^2}$

$\left(-139675536 - 1563998436 i - 3795299508 i^2 - 2768453688 i^3 - 257693436 i^4 + 298730614 i^5 + 156608530 i^6 + 78823080 i^7 + 170203000 i^8 + 514823500 i^9 + 1063054839 i^{10} + 1659500964 i^{11} + 1851274557 i^{12} + 1525581972 i^{13} + 817657704 i^{14} + 292653504 i^{15}\right) +$

$\dfrac{1}{1627920} \left(\left(7752 i^{15} + 79458 i^{16} + 135318 i^{17} + 25042 i^{18} - 9730 i^{19} - 7130 i^{20} - 1815 i^{21} - 180 i^{22}\right) \mathrm{Log20}[i]\right)$

Q6 $[l = 5, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{6453009763200 i^3 (1+i)^4}$

$\left(-1186215030 - 3759816060 i - 4176031860 i^2 - 1726467496 i^3 + 60879377 i^4 + 662851494 i^5 + 2424869940 i^6 + 8157824130 i^7 + 20604498486 i^8 + 39211507258 i^9 + 56873467156 i^{10} + 62930165430 i^{11} + 52446408795 i^{12} + 31956918444 i^{13} + 13301664552 i^{14} + 3219188544 i^{15}\right) +$

$\dfrac{\left(13167 i^{17} + 2926 i^{18} - 462 i^{19} - 462 i^{20} - 121 i^{21} - 12 i^{22}\right) \mathrm{Log20}[i]}{3581424}$

Q6 $[l = 6, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$=$

$\dfrac{1}{115321852800 (1+i)^6} \left(50820 + 983263 i + 8955472 i^2 + 50958875 i^3 + 202701096 i^4 + 597335120 i^5 + 1347854832 i^6 + 2372450828 i^7 + 3285508600 i^8 + 3580608559 i^9 + 3045522920 i^{10} + 1983603743 i^{11} + 954091612 i^{12} + 314692440 i^{13} + 57530176 i^{14}\right)$

Q6 $[l = 7, k_1 = 0, k_2 = 1, k_3 = 1, k_4 = 1]$

$= \dfrac{1}{22487761296000 (1+i)^8}$

$\left(8626226 + 184130204 i + 1862060694 i^2 + 11852105946 i^3 + 53195729334 i^4 + 178718561919 i^5 + 465524448600 i^6 + 960521499840 i^7 + 1589638704210 i^8 + 2122501231290 i^9 + 2286514816410 i^{10} + 1975871972610 i^{11} + 1352297771670 i^{12} + 716644325505 i^{13} + 282529178820 i^{14} + 76375766040 i^{15} + 11218384320 i^{16}\right)$

Q6 $[l = 0, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \dfrac{1}{586637251200}$

$\left(27791673 + 339041976 i + 1864083156 i^2 + 6054410624 i^3 + 12748400835 i^4 + 17854333668 i^5 + 16197369888 i^6 + 8653045968 i^7 + 2075179392 i^8\right)$

Q6 $[l = 1, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$=$

$\frac{1}{65181916800} \left(1630650 + 20213488i + 113497524i^2 + 379354976i^3 + 832089895i^4 + 1239168980i^5 + 1239896224i^6 + 773696112i^7 + 230575488i^8\right)$

Q6 $[l = 2, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \frac{1}{195545750400i^4}$

$\left(142117416 + 190312416i + 145064808i^2 + 44672544i^3 + 23895620i^4 + 28043904i^5 + 225757788i^6 + 711536416i^7 + 1632450873i^8 + 2462296716i^9 + 2619648864i^{10} + 1757828016i^{11} + 691726464i^{12}\right) +$

$\frac{\left(-3492i^{16} - 8352i^{17} - 8476i^{18} - 4848i^{19} - 1659i^{20} - 308i^{21} - 24i^{22}\right) \text{Log20}[i]}{240240}$

Q6 $[l = 3, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$= \frac{1}{586637251200i^4(1 + i)^2}$

$\left(1462564026 + 5919037740i + 9421361334i^2 + 7867118952i^3 + 3931113907i^4 + 1312559150i^5 + 817297135i^6 + 2502192880i^7 + 6890691995i^8 + 13636713730i^9 + 19682197071i^{10} + 20728498020i^{11} + 15539597184i^{12} + 7734061872i^{13} + 2075179392i^{14}\right) +$

$\frac{1}{1113840} \left(\left(-55539i^{16} - 172152i^{17} - 194348i^{18} - 114000i^{19} - 40635i^{20} - 7700i^{21} - 600i^{22}\right) \text{Log20}[i]\right)$

Q6 $[l = 4, k_1 = 1, k_2 = 0, k_3 = 1, k_4 = 0]$

$=$

$\frac{1}{195545750400i^4(1 + i)^4} \left(52378326 + 540540000i + 1910412504i^2 + 3374507136i^3 + 3419812851i^4 + 2155154820i^5 + 1053453986i^6 + 1166837908i^7 + 3140291642i^8 + 7468228088i^9 + 13488650578i^{10} + 18572475068i^{11} + 19498445601i^{12} + 15398263404i^{13} + 8833341984i^{14} + 3398213232i^{15} + 691726464i^{16}\right) +$

$\frac{1}{542640} \left(\left(-2907i^{16} - 21432i^{17} - 34428i^{18} - 20880i^{19} - 7903i^{20} - 1540i^{21} - 120i^{22}\right) \text{Log20}[i]\right)$

$Q6\left[l=5, k_1=1, k_2=0, k_3=1, k_4=0\right]$

$$= \frac{1}{6453009763200i^2(1+i)^6}$$
$$\left(527206680 + 2941258320i + 6989313968i^2 + 9832077216i^3 + \right.$$
$$13770390036i^4 + 39188710200i^5 + 136095731097i^6 + 379942193130i^7 +$$
$$818809126167i^8 + 1378170323904i^9 + 1826811889815i^{10} +$$
$$1908031378418i^{11} + 1557427871373i^{12} + 973854937836i^{13} +$$
$$\left. 448142561856i^{14} + 139207392720i^{15} + 22826973312i^{16}\right) +$$
$$\frac{\left(-29260i^{18} - 18480i^{19} - 7623i^{20} - 1540i^{21} - 120i^{22}\right)\mathrm{Log20}[i]}{17907120}$$

$Q6\left[l=6, k_1=1, k_2=0, k_3=1, k_4=0\right]$

$$= \frac{1}{345965558400(1+i)^8}$$
$$\left(1777930 + 36445472i + 353818852i^2 + 2161398448i^3 + 9309053777i^4 + \right.$$
$$30012142708i^5 + 75036481692i^6 + 148685087208i^7 + 236523480432i^8 +$$
$$303960357008i^9 + 315741071272i^{10} + 263694162248i^{11} + 174851544587i^{12} +$$
$$\left. 89928483748i^{13} + 34358590112i^{14} + 8914443408i^{15} + 1223823744i^{16}\right)$$

$Q6\left[l=7, k_1=1, k_2=0, k_3=1, k_4=0\right]$

$$= \frac{1}{7495920432000(1+i)^{10}}$$
$$\left(32535069 + 731662554i + 7833497293i^2 + 53088072536i^3 + 255389886457i^4 + \right.$$
$$926904702606i^5 + 2632843052457i^6 + 5991514577316i^7 + 11089454132625i^8 +$$
$$16847507737290i^9 + 21105541213065i^{10} + 21812083979280i^{11} +$$
$$18528701855205i^{12} + 12827902905390i^{13} + 7130424532965i^{14} +$$
$$\left. 3102531029580i^{15} + 1010210872320i^{16} + 224586990480i^{17} + 26516181120i^{18}\right)$$

$Q6\left[l=0, k_1=1, k_2=0, k_3=1, k_4=1\right]$

$$= \frac{1}{586637251200}\left(-2746835 - 34646157i - 197183662i^2 - 663954608i^3 - \right.$$
$$\left. 1452451485i^4 - 2120435055i^5 - 2017190556i^6 - 1140264936i^7 - 292653504i^8\right)$$

$Q6\left[l=1, k_1=1, k_2=0, k_3=1, k_4=1\right]$

$$= \frac{1}{195545750400}\left(-541530 - 6911238i - 39961754i^2 - 137557056i^3 - \right.$$
$$\left. 310711275i^4 - 476411985i^5 - 490736484i^6 - 315514152i^7 - 97551168i^8\right)$$

$Q6\,[l=2, k_1=1, k_2=0, k_3=1, k_4=1]$

$=$

$\frac{1}{195545750400i^4}\left(-47372472 - 78577128i - 57352764i^2 - 22722000i^3 - 6051780i^4 - 4489716i^5 - 28146754i^6 - 94107808i^7 - 218762295i^8 - 339768165i^9 - 366719988i^{10} - 250939992i^{11} - 97551168i^{12}\right) +$

$\frac{\left(1164i^{16} + 3156i^{17} + 3438i^{18} + 2040i^{19} + 725i^{20} + 143i^{21} + 12i^{22}\right)\text{Log20}[i]}{240240}$

$Q6\,[l=3, k_1=1, k_2=0, k_3=1, k_4=1]$

$= \frac{1}{586637251200i^4(1+i)}$

$\left(-487521342 - 1754493048i - 2129124690i^2 - 1268181684i^3 - 451646825i^4 - 104099240i^5 - 75653325i^6 - 277224310i^7 - 697682425i^8 - 1269785580i^9 - 1613377647i^{10} - 1460139588i^{11} - 851751000i^{12} - 292653504i^{13}\right) +$

$\frac{1}{1113840}\left(\left(18513i^{16} + 67599i^{17} + 83326i^{18} + 49800i^{19} + 17925i^{20} + 3575i^{21} + 300i^{22}\right)\text{Log20}[i]\right)$

$Q6\,[l=4, k_1=1, k_2=0, k_3=1, k_4=1]$

$= \frac{1}{586637251200i^4(1+i)^3}$

$\left(-52378326 - 575458884i - 1828466640i^2 - 2640333696i^3 - 2022321483i^4 - 916864494i^5 - 334801870i^6 - 379288080i^7 - 1043108550i^8 - 2322691780i^9 - 3843884256i^{10} - 4749729174i^{11} - 4343370075i^{12} - 2848941396i^{13} - 1243335528i^{14} - 292653504i^{15}\right) + \frac{1}{1627920}$

$\left(\left(2907i^{16} + 26277i^{17} + 47538i^{18} + 28920i^{19} + 10595i^{20} + 2145i^{21} + 180i^{22}\right)\right.$

$\left.\text{Log20}[i]\right)$

$Q6\,[l=5, k_1=1, k_2=0, k_3=1, k_4=1]$

$= \frac{1}{6453009763200i^2(1+i)^5}$

$\left(-263603340 - 1207025820i - 2266903600i^2 - 2351148176i^3 - 2167784086i^4 - 4938940254i^5 - 16215350055i^6 - 42740431860i^7 - 85998664169i^8 - 133430925694i^9 - 160362000161i^{10} - 148443378600i^{11} - 103896442485i^{12} - 52870388076i^{13} - 17984120616i^{14} - 3219188544i^{15}\right) +$

$\frac{\left(2926i^{18} + 1848i^{19} + 693i^{20} + 143i^{21} + 12i^{22}\right)\text{Log20}[i]}{3581424}$

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$Q6\left[l=6, k_1=1, k_2=0, k_3=1, k_4=1\right]$

$= \dfrac{1}{115321852800(1+i)^7}$

$\left(-86730 - 1721468i - 16128330i^2 - 94709822i^3 - 390299151i^4 - 1197278776i^5 - 2828954372i^6 - 5253298440i^7 - 7749454768i^8 - 9111078504i^9 - 8505404094i^{10} - 6230052918i^{11} - 3498064825i^{12} - 1441434012i^{13} - 398372696i^{14} - 57530176i^{15}\right)$

$Q6\left[l=7, k_1=1, k_2=0, k_3=1, k_4=1\right]$

$= \dfrac{1}{22487761296000(1+i)^9}$

$\left(-14613165 - 319228392i - 3311150681i^2 - 21672384042i^3 - 100330522713i^4 - 348934943652i^5 - 945003818439i^6 - 2038128039720i^7 - 3549134831745i^8 - 5027697649080i^9 - 5807394881145i^{10} - 5455361080830i^{11} - 4134127334445i^{12} - 2489246121060i^{13} - 1160247670815i^{14} - 399712441860i^{15} - 92693415960i^{16} - 11218384320i^{17}\right)$

$Q6\left[l=0, k_1=1, k_2=1, k_3=1, k_4=1\right]$

$= \dfrac{1}{586637251200}\left(381017 + 4938934i + 28908529i^2 + 100196076i^3 + 225889005i^4 + 340512642i^5 + 335640282i^6 + 197644992i^7 + 53209728i^8\right)$

$Q6\left[l=1, k_1=1, k_2=1, k_3=1, k_4=1\right]$

$= \dfrac{1}{195545750400}\left(79950 + 1046996i + 6213053i^2 + 21950292i^3 + 50882475i^4 + 80043390i^5 + 84556878i^6 + 55752384i^7 + 17736576i^8\right)$

$Q6\left[l=2, k_1=1, k_2=1, k_3=1, k_4=1\right]$

$=$

$\dfrac{1}{195545750400i^4}\left(15790824 + 31238928i + 23776438i^2 + 10011120i^3 + 2448124i^4 + 909832i^5 + 4525285i^6 + 15727236i^7 + 37283415i^8 + 59440854i^9 + 65362926i^{10} + 45623104i^{11} + 17736576i^{12}\right) +$

$\dfrac{\left(-388i^{16} - 1176i^{17} - 1391i^{18} - 860i^{19} - 317i^{20} - 66i^{21} - 6i^{22}\right)\text{Log20}[i]}{240240}$

$Q6\,[l=3, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{586637251200i^4}$

$(162507114 + 511991172i + 400553538i^2 + 156063600i^3 + 45679795i^4 -$

$2395470i^5 + 18156105i^6 + 28587900i^7 + 94222425i^8 + 132030810i^9 +$

$162894714i^{10} + 106481472i^{11} + 53209728i^{12}) + \dfrac{1}{1113840}$

$\left((-6171i^{16} - 25938i^{17} - 35657i^{18} - 21900i^{19} - 7965i^{20} - 1650i^{21} - 150i^{22})\right.$

$\left.\text{Log20}[i]\right)$

$Q6\,[l=4, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{586637251200i^4(1+i)^2}$

$(17459442 + 203459256i + 570533964i^2 + 616143528i^3 + 317703477i^4 +$

$101607688i^5 + 30017364i^6 + 48421560i^7 + 137426410i^8 + 282085416i^9 +$

$425155419i^{10} + 462466422i^{11} + 359485434i^{12} + 182513088i^{13} + 53209728i^{14}) +$

$\dfrac{(-969i^{16} - 10374i^{17} - 21831i^{18} - 13460i^{19} - 4811i^{20} - 990i^{21} - 90i^{22})\,\text{Log20}[i]}{1627920}$

$Q6\,[l=5, k_1=1, k_2=1, k_3=1, k_4=1]$

$=$

$\dfrac{1}{6453009763200i^2(1+i)^4}\left(131801670 + 471711240i + 657737132i^2 + 475141160i^3 +\right.$

$313185327i^4 + 697483016i^5 + 2233171289i^6 + 5548198326i^7 +$

$10371227097i^8 + 14722588716i^9 + 15855333351i^{10} +$

$12754635894i^{11} + 7389266478i^{12} + 2843991744i^{13} + 585307008i^{14}) +$

$\dfrac{(-7315i^{18} - 4620i^{19} - 1617i^{20} - 330i^{21} - 30i^{22})\,\text{Log20}[i]}{17907120}$

$Q6\,[l=6, k_1=1, k_2=1, k_3=1, k_4=1]$

$=$

$\dfrac{1}{345965558400(1+i)^6}\left(43610 + 837368i + 7562787i^2 + 42633470i^3 + 167817716i^4 +\right.$

$488723280i^5 + 1087996692i^6 + 1885410648i^7 + 2563522500i^8 + 2732574064i^9 +$

$2260756135i^{10} + 1419784158i^{11} + 648536842i^{12} + 197314240i^{13} + 31380096i^{14})$

$Q6\,[l=7, k_1=1, k_2=1, k_3=1, k_4=1]$

$= \dfrac{1}{22487761296000(1+i)^8}$

$(2471847 + 52410050i + 526147575i^2 + 3322238556i^3 + 14780345853i^4 +$

$49174903722i^5 + 126707643960i^6 + 258272741040i^7 + 421575326115i^8 +$

$554034683730i^9 + 585865599165i^{10} + 495086099340i^{11} + 329506654785i^{12} +$

$168306376650i^{13} + 62993536890i^{14} + 15739970880i^{15} + 2039706240i^{16})$

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S-22.5   Analytic formulas of the integrals L

$L\left[l = 0, i, k = 0, k' = 0\right]$

$$= \frac{-49 + 450i - 1815i^2 + 4180i^3 - 5940i^4 + 5148i^5}{13860}$$

$L\left[l = 1, i, k = 0, k' = 0\right]$

$$= \frac{-153 + 1736i - 8918i^2 + 27300i^3 - 55055i^4 + 76076i^5 - 72072i^6 + 44616i^7}{120120}$$

$L\left[l = 2, i, k = 0, k' = 0\right]$

$$= \frac{1}{20020}\left(-11 + 148i - 918i^2 + 3472i^3 - \right.$$
$$\left. 8918i^4 + 16380i^5 - 22022i^6 + 21736i^7 - 15444i^8 + 7436i^9\right)$$

$L\left[l = 3, i, k = 0, k' = 0\right]$

$$= \frac{1}{1113840}\left(-299 + 4644i - 33660i^2 + 150960i^3 - 468180i^4 + 1062432i^5 - \right.$$
$$\left. 1819272i^6 + 2386800i^7 - 2406690i^8 + 1847560i^9 - 1050192i^{10} + 413712i^{11}\right)$$

$L\left[l = 4, i, k = 0, k' = 0\right]$

$$= \frac{1}{271320}$$
$$\left(-39 + 686i - 5681i^2 + 29412i^3 - 106590i^4 + 286824i^5 - 593028i^6 + 961248i^7 - \right.$$
$$\left. 1234506i^8 + 1259700i^9 - 1016158i^{10} + 638248i^{11} - 302328i^{12} + 100776i^{13}\right)$$

$L\left[l = 5, i, k = 0, k' = 0\right]$

$$= \frac{1}{5969040}$$
$$\left(-493 + 9680i - 90090i^2 + 528220i^3 - 2187185i^4 + 6794172i^5 - 16414860i^6 + \right.$$
$$31550640i^7 - 48924810i^8 + 61680080i^9 - 63371308i^{10} + 52907400i^{11} - $$
$$\left. 35565530i^{12} + 18901960i^{13} - 7674480i^{14} + 2217072i^{15}\right)$$

$L\left[l = 6, i, k = 0, k' = 0\right]$

$$= \frac{1}{3028410}\left(-152 + 3294i - 34017i^2 + 222640i^3 - \right.$$
$$1036035i^4 + 3644718i^5 - 10061051i^6 + 22323708i^7 - 40450905i^8 + $$
$$60472060i^9 - 75018042i^{10} + 77380464i^{11} - 66251822i^{12} + $$
$$\left. 46802700i^{13} - 26967270i^{14} + 12421288i^{15} - 4412826i^{16} + 1124838i^{17}\right)$$

$L[l = 7, i, k = 0, k' = 0]$

$= \dfrac{1}{4604600}$

$\left(-147 + 3484i - 39520i^2 + 285480i^3 - 1474070i^4 + 5788640i^5 - 17957940i^6 + \right.$

$45125080i^7 - 93424045i^8 + 161226780i^9 - 233716340i^{10} + 285867920i^{11} - $

$295525620i^{12} + 257934880i^{13} - 189290920i^{14} + 115892400i^{15} - $

$\left. 58429085i^{16} + 23746580i^{17} - 7498920i^{18} + 1710280i^{19}\right)$

$L[l = 0, i, k = 0, k' = 1]$

$= \dfrac{13 - 115i + 440i^2 - 935i^3 + 1155i^4 - 726i^5}{13860}$

$L[l = 1, i, k = 0, k' = 1]$

$= \dfrac{128 - 1421i + 7098i^2 - 20930i^3 + 40040i^4 - 51051i^5 + 42042i^6 - 18876i^7}{360360}$

$L[l = 2, i, k = 0, k' = 1]$

$= \dfrac{1}{120120}\left(19 - 252i + 1536i^2 - 5684i^3 + \right.$

$\left. 14196i^4 - 25116i^5 + 32032i^6 - 29172i^7 + 18018i^8 - 6292i^9\right)$

$L[l = 3, i, k = 0, k' = 1]$

$= \dfrac{1}{1113840}\left(88 - 1353i + 9690i^2 - 42840i^3 + 130560i^4 - 289884i^5 + \right.$

$\left. 482664i^6 - 609960i^7 + 583440i^8 - 413270i^9 + 204204i^{10} - 58344i^{11}\right)$

$L[l = 4, i, k = 0, k' = 1]$

$= \dfrac{1}{813960}$

$\left(35 - 611i + 5016i^2 - 25707i^3 + 92055i^4 - 244188i^5 + 496128i^6 - 786828i^7 + \right.$

$\left. 982566i^8 - 965770i^9 + 739024i^{10} - 428298i^{11} + 176358i^{12} - 42636i^{13}\right)$

$L[l = 5, i, k = 0, k' = 1]$

$= \dfrac{1}{17907120}$

$\left(448 - 8745i + 80850i^2 - 470470i^3 + 1931160i^4 - 5938317i^5 + 14176470i^6 - \right.$

$26860680i^7 + 40930560i^8 - 50488130i^9 + 50438388i^{10} - 40562340i^{11} + $

$\left. 25865840i^{12} - 12684210i^{13} + 4476780i^{14} - 937992i^{15}\right)$

$L\left[l=6, i, k=0, k'=1\right]$

$=$

$\frac{1}{6056820}\left(93 - 2006i + 20608i^2 - 134090i^3 + 619850i^4 - 2164162i^5 + 5922224i^6 -\right.$
$13007742i^7 + 23289915i^8 - 34321980i^9 + 41840128i^{10} -$
$42226436i^{11} + 35154028i^{12} - 23921380i^{13} +$
$\left.13075040i^{14} - 5556892i^{15} + 1716099i^{16} - 317262i^{17}\right)$

$L\left[l=7, i, k=0, k'=1\right]$

$=\frac{1}{13813800}$

$\left(136 - 3211i + 36270i^2 - 260780i^3 + 1339520i^4 - 5229510i^5 + 16116100i^6 -\right.$
$40191580i^7 + 82488120i^8 - 140917205i^9 + 201845930i^{10} - 243374040i^{11} +$
$247237120i^{12} - 211132180i^{13} + 150660120i^{14} - 88850840i^{15} +$
$\left.42493880i^{16} - 15935205i^{17} + 4374370i^{18} - 723580i^{19}\right)$

$L\left[l=0, i, k=1, k'=1\right]$

$=\frac{-7 + 60i - 220i^2 + 440i^3 - 495i^4 + 264i^5}{27720}$

$L\left[l=1, i, k=1, k'=1\right]$

$=\frac{-36 + 392i - 1911i^2 + 5460i^3 - 10010i^4 + 12012i^5 - 9009i^6 + 3432i^7}{360360}$

$L\left[l=2, i, k=1, k'=1\right]$

$=\frac{1}{240240}\left(-11 + 144i - 864i^2 + 3136i^3 -\right.$
$\left.7644i^4 + 13104i^5 - 16016i^6 + 13728i^7 - 7722i^8 + 2288i^9\right)$

$L\left[l=3, i, k=1, k'=1\right]$

$=\frac{1}{1113840}\left(-26 + 396i - 2805i^2 + 12240i^3 - 36720i^4 + 79968i^5 -\right.$
$\left.129948i^6 + 159120i^7 - 145860i^8 + 97240i^9 - 43758i^{10} + 10608i^{11}\right)$

$L\left[l=4, i, k=1, k'=1\right]$

$=\frac{1}{1627920}$

$\left(-21 + 364i - 2964i^2 + 15048i^3 - 53295i^4 + 139536i^5 - 279072i^6 + 434112i^7 -\right.$
$\left.529074i^8 + 503880i^9 - 369512i^{10} + 201552i^{11} - 75582i^{12} + 15504i^{13}\right)$

$L\left[l=5,i,k=1,k'=1\right]$

$=\dfrac{1}{17907120}$

$\left(-136+2640i-24255i^2+140140i^3-570570i^4+1738044i^5-4103715i^6+\right.$

$7674480i^7-11511720i^8+13927760i^9-13579566i^{10}+10581480i^{11}-$

$\left.6466460i^{12}+2984520i^{13}-959310i^{14}+170544i^{15}\right)$

$L\left[l=6,i,k=1,k'=1\right]$

$=\dfrac{1}{12113640}$

$\left(-57+1224i-12512i^2+80960i^3-371910i^4+1289288i^5-3499496i^6+7614288\right.$

$i^7-13483635i^8+19612560i^9-23535072i^{10}+23297344i^{11}-18929092i^{12}+$

$\left.12480720i^{13}-6537520i^{14}+2615008i^{15}-735471i^{16}+115368i^{17}\right)$

$L\left[l=7,i,k=1,k'=1\right]$

$=$

$\dfrac{1}{13813800}\left(-42+988i-11115i^2+79560i^3-406640i^4+1578720i^5-4834830i^6+\right.$

$11971960i^7-24371490i^8+41244060i^9-58429085i^{10}+$

$69535440i^{11}-69535440i^{12}+58243360i^{13}-40562340i^{14}+$

$\left.23178480i^{15}-10623470i^{16}+3749460i^{17}-937365i^{18}+131560i^{19}\right)$

S-22.6   Analytic formulas of the integrals R

$R\left[l=0,i,k=0,k'=0\right]$

$=\dfrac{1}{840}\left(11+76i+216i^2+312i^3\right)$

$R\left[l=1,i,k=0,k'=0\right]$

$=\dfrac{1}{35}\left(3+13i\right)$

$R\left[l=2,i,k=0,k'=0\right]$

$=\dfrac{1}{232792560i^{20}}$

$\left(-11639628+12252240i+56904848i^2-13261248i^3-90717627i^4-\right.$

$44316272i^5-33462i^6+45276i^7-62491i^8+88236i^9-127908i^{10}+$

$191216i^{11}-296514i^{12}+480624i^{13}-823004i^{14}+1511640i^{15}-$

$\left.3048474i^{16}+7020728i^{17}-19953648i^{18}+86465808i^{19}\right)+$

$\left(1-6i^2-4i^3+9i^4+12i^5+4i^6\right)\text{Log20}[i]$

$R\left[l=3, i, k=0, k'=0\right]$

$=$

$\dfrac{1}{38798760i^{20}}\left(-11639628 - 11027016i + 116328212i^2 + 110350240i^3 + 585585i^4 - \right.$
$686686i^5 + 812383i^6 - 970596i^7 + 1172490i^8 - 1434120i^9 +$
$1779084i^{10} - 2242912i^{11} + 2880514i^{12} - 3779100i^{13} + 5080790i^{14} -$
$7020728i^{15} + 9976824i^{16} - 14410968i^{17} + 38798760i^{18} +$
$\left.1086365280i^{20} - 1086365280i^{21} - 6983776800i^{22} - 4655851200i^{23}\right) +$
$\left(6 + 12i - 54i^2 - 120i^3 - 60i^4\right)\text{Log20}[i]$

$R\left[l=4, i, k=0, k'=0\right]$

$= \dfrac{1}{77597520i^{20}}$

$\left(-34918884 - 196035840i - 26546520i^2 + 27467440i^3 - 28433405i^4 + \right.$
$29441412i^5 - 30484740i^6 + 31550640i^7 - 32616540i^8 + 33643680i^9 -$
$34566168i^{10} + 35271600i^{11} - 35565530i^{12} + 35103640i^{13} -$
$\left.33256080i^{14} + 28821936i^{15}\right) + \left(9 + 60i + 60i^2\right)\text{Log20}[i]$

$R\left[l=5, i, k=0, k'=0\right]$

$=$

$\left(-11639628 - 11027016i - 68068i^2 + 80080i^3 - 95095i^4 + 114114i^5 - 138567i^6 + \right.$
$170544i^7 - 213180i^8 + 271320i^9 - 352716i^{10} + 470288i^{11} - 646646i^{12} +$
$\left.923780i^{13} + 8314020i^{14} + 21616452i^{15}\right) / \left(58198140i^{20}(1+i)^2\right) + 4\text{Log20}[i]$

$R\left[l=6, i, k=0, k'=0\right]$

$= \dfrac{35 + 140i + 200i^2 + 104i^3}{280i^8(1+i)^4}$

$R\left[l=7, i, k=0, k'=0\right]$

$= \dfrac{42 + 252i + 623i^2 + 800i^3 + 540i^4 + 156i^5}{420i^{10}(1+i)^6}$

$R\left[l=0, i, k=0, k'=1\right]$

$= \dfrac{8 + 51i + 126i^2 + 132i^3}{2520}$

$R\left[l=1, i, k=0, k'=1\right]$

$= \dfrac{1}{420}(7 + 22i)$

$R\left[l=2,i,k=0,k'=1\right]$

$=\dfrac{1}{232792560i^{19}}$

$\left(-11639628-11027016i+34850816i^{2}+56440384i^{3}+22163141i^{4}+\right.$

$10010i^{5}-13442i^{6}+18392i^{7}-25707i^{8}+36822i^{9}-54264i^{10}+82688i^{11}-$

$131138i^{12}+218348i^{13}-386308i^{14}+739024i^{15}-1570426i^{16}+$

$3879876i^{17}-12193896i^{18}+124156032i^{19}+783734952i^{20}+$

$\left.77597520i^{21}-2405523120i^{22}-2793510720i^{23}-931170240i^{24}\right)+$

$\left(i+2i^{2}-2i^{3}-8i^{4}-7i^{5}-2i^{6}\right)\text{Log20}[i]$

$R\left[l=3,i,k=0,k'=1\right]$

$=\dfrac{1}{116396280i^{20}}$

$\left(-11639628+47171124i+229661432i^{2}+165825660i^{3}+525525i^{4}-\right.$

$611611i^{5}+717288i^{6}-848331i^{7}+1012605i^{8}-1220940i^{9}+1488384i^{10}-$

$1835932i^{11}+2292654i^{12}-2897310i^{13}+3695120i^{14}-4711278i^{15}+$

$5819814i^{16}-6096948i^{17}+116396280i^{19}+504383880i^{20}-$

$\left.5354228880i^{21}-12803590800i^{22}-6983776800i^{23}\right)+$

$\left(2-6i-48i^{2}-70i^{3}-30i^{4}\right)\text{Log20}[i]$

$R\left[l=4,i,k=0,k'=1\right]$

$=\dfrac{1}{232792560i^{20}}$

$\left(-93117024-309369060i-23823800i^{2}+24464440i^{3}-25105080i^{4}+\right.$

$25732707i^{5}-26327730i^{6}+26860680i^{7}-27287040i^{8}+27538980i^{9}-$

$27511848i^{10}+27041560i^{11}-25865840i^{12}+23556390i^{13}-$

$\left.19399380i^{14}+12193896i^{15}\right)+\left(8+35i+30i^{2}\right)\text{Log20}[i]$

$R\left[l=5,i,k=0,k'=1\right]$

$=$

$\left(-11639628-11027016i-68068i^{2}+80080i^{3}-95095i^{4}+114114i^{5}-138567i^{6}+\right.$

$170544i^{7}-213180i^{8}+271320i^{9}-352716i^{10}+470288i^{11}-646646i^{12}+$

$\left.923780i^{13}-1385670i^{14}+6096948i^{15}\right)/\left(116396280i^{20}(1+i)^{2}\right)+2\text{Log20}[i]$

$R\left[l=6,i,k=0,k'=1\right]$

$=\dfrac{15+50i+44i^{2}}{840i^{7}(1+i)^{4}}$

$R\left[l=7,i,k=0,k'=1\right]$

$=\dfrac{14+77i+165i^{2}+165i^{3}+66i^{4}}{1260i^{9}(1+i)^{6}}$

$R\left[l=0, i, k=1, k'=1\right]$

$$= \frac{2 + 12i + 27i^2 + 24i^3}{2520}$$

$R\left[l=1, i, k=1, k'=1\right]$

$$= \frac{1}{840}(3 + 8i)$$

$R\left[l=2, i, k=1, k'=1\right]$

$$= \frac{1}{232792560i^{18}}$$
$$\left(-11639628 - 34306272i - 33761728i^2 - 11083072i^3 - 3003i^4 + 4004i^5 - 5434i^6 + 7524i^7 - 10659i^8 + 15504i^9 - 23256i^{10} + 36176i^{11} - 58786i^{12} + 100776i^{13} - 184756i^{14} + 369512i^{15} - 831402i^{16} + 2217072i^{17}\right) + \left(i^2 + 4i^3 + 6i^4 + 4i^5 + i^6\right)\mathrm{Log20}[i]$$

$R\left[l=3, i, k=1, k'=1\right]$

$$= \frac{1}{232792560i^{20}}$$
$$\left(-11639628 - 127423296i - 284932648i^2 - 166005840i^3 - 315315i^4 + 364364i^5 - 423852i^6 + 496584i^7 - 586245i^8 + 697680i^9 - 837216i^{10} + 1012928i^{11} - 1234506i^{12} + 1511640i^{13} - 1847560i^{14} + 2217072i^{15} - 2494206i^{16} + 2217072i^{17}\right) + \left(1 + 12i + 36i^2 + 40i^3 + 15i^4\right)\mathrm{Log20}[i]$$

$R\left[l=4, i, k=1, k'=1\right]$

$=$

$$\frac{1}{232792560i^{20}}\left(-69837768 - 159279120i - 7147140i^2 + 7287280i^3 - 7417410i^4 + 7531524i^5 - 7621185i^6 + 7674480i^7 - 7674480i^8 + 7596960i^9 - 7407036i^{10} + 7054320i^{11} - 6466460i^{12} + 5542680i^{13} - 4157010i^{14} + 2217072i^{15}\right) + \left(6 + 20i + 15i^2\right)\mathrm{Log20}[i]$$

$R\left[l=5, i, k=1, k'=1\right]$

$=$

$$\left(-11639628 - 11027016i - 68068i^2 + 80080i^3 - 95095i^4 + 114114i^5 - 138567i^6 + 170544i^7 - 213180i^8 + 271320i^9 - 352716i^{10} + 470288i^{11} - 646646i^{12} + 923780i^{13} - 1385670i^{14} + 2217072i^{15}\right) / \left(232792560i^{20}(1+i)^2\right) + \mathrm{Log20}[i]$$

$R\left[l=6, i, k=1, k'=1\right]$

$$= \frac{5 + 8i}{840i^6(1+i)^4}$$

$$R\left[l=7, i, k=1, k'=1\right]$$
$$= \frac{7 + 30i + 45i^2 + 24i^3}{2520i^8(1+i)^6}$$