Diagrams and algebraic expressions at order 4 in BMBPT

RDL, JR, PA, MD, AT, TD, JPE

May 24, 2018

Valid diagrams: 59
2N valid diagrams: 59
2N canonical diagrams for the energy: 10
2N canonical diagrams for a generic operator only: 6
2N non-canonical diagrams: 43

Contents

1 Time-structure diagrams **1**
1.1 Tree diagrams . . . 1
1.2 Non-tree diagrams . . . 3

2 Two-body diagrams **3**
2.1 Two-body energy canonical diagrams . . . 3
2.2 Two-body canonical diagrams for a generic operator only . . . 10
2.3 Two-body non-canonical diagrams . . . 14

1 Time-structure diagrams

1.1 Tree diagrams

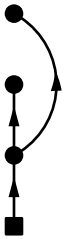
Time-structure diagram T1:

$$\mathrm{T1} = \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{1}$$

Number of related Feynman diagrams: 35.

Related Feynman diagrams: 59, 58, 57, 56, 53, 52, 51, 49, 45, 42, 41, 37, 36, 34, 33, 32, 30, 28, 26, 24, 22, 18, 17, 16, 15, 14, 13, 12, 11, 10, 8, 7, 5, 4, 3.

Time-structure diagram T2:

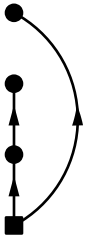


$$\mathrm{T2} = \frac{1}{(a_1 + a_2 + a_3)a_2 a_3} \tag{2}$$

Number of related Feynman diagrams: 10.

Related Feynman diagrams: 55, 46, 38, 35, 25, 23, 21, 19, 2, 1.

Time-structure diagram T3:



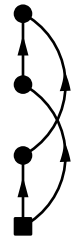
$$\mathrm{T3} = \frac{1}{(a_1 + a_2)a_2a_3} \tag{3}$$

Number of related Feynman diagrams: 4.

Related Feynman diagrams: 54, 47, 44, 29.

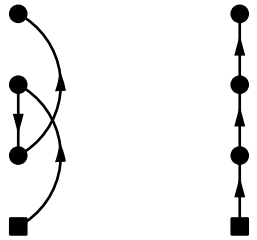
1.2 Non-tree diagrams

Time-structure diagram T4:



$$\mathrm{T4} = \frac{1}{(a_1 + a_3)(a_2 + a_1 + a_3)a_3} + \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{4}$$

Equivalent tree diagrams: T1, T1.



Number of related Feynman diagrams: 10.

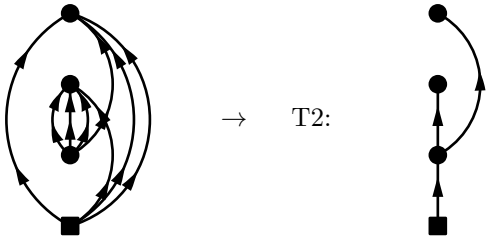
Related Feynman diagrams: 6, 9, 20, 27, 31, 39, 40, 43, 48, 50.

2 Two-body diagrams

2.1 Two-body energy canonical diagrams

Diagram 1:

$$\begin{aligned}\mathrm{PO4.1} &= \lim_{\tau\to\infty}\frac{-(-1)^3}{(3!)^2}\sum_{k_i}O^{40}_{k_1k_2k_3k_4}\Omega^{40}_{k_5k_6k_7k_8}\Omega^{04}_{k_5k_6k_7k_1}\Omega^{04}_{k_8k_2k_3k_4}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)e^{-\tau_1\epsilon^{k_5k_6k_7k_8}}e^{-\tau_2\epsilon_{k_1k_5k_6k_7}}e^{-\tau_3\epsilon_{k_2k_3k_4k_8}}\\ &= \frac{-(-1)^3}{(3!)^2}\sum_{k_i}\frac{O^{40}_{k_1k_2k_3k_4}\Omega^{40}_{k_5k_6k_7k_8}\Omega^{04}_{k_5k_6k_7k_1}\Omega^{04}_{k_8k_2k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_1k_5k_6k_7}\ \epsilon_{k_2k_3k_4k_8}}\end{aligned} \tag{5}$$

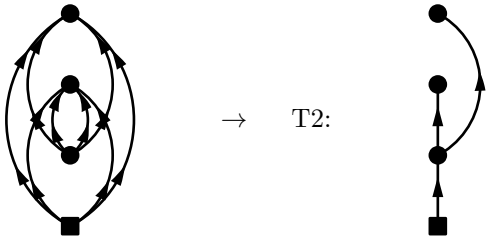


$$\mathrm{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{6}$$

$$\begin{aligned}a_1 &= \epsilon^{k_5k_6k_7k_8}\\ a_2 &= \epsilon_{k_1k_5k_6k_7}\\ a_3 &= \epsilon_{k_2k_3k_4k_8}\end{aligned}$$

Diagram 2:

$$\begin{aligned}\mathrm{PO4.2} &= \lim_{\tau\to\infty}\frac{(-1)^3}{2(2!)^4}\sum_{k_i}O^{40}_{k_1k_2k_3k_4}\Omega^{40}_{k_5k_6k_7k_8}\Omega^{04}_{k_5k_6k_1k_2}\Omega^{04}_{k_7k_8k_3k_4}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)e^{-\tau_1\epsilon^{k_5k_6k_7k_8}}e^{-\tau_2\epsilon_{k_1k_2k_5k_6}}e^{-\tau_3\epsilon_{k_3k_4k_7k_8}}\\ &= \frac{(-1)^3}{2(2!)^4}\sum_{k_i}\frac{O^{40}_{k_1k_2k_3k_4}\Omega^{40}_{k_5k_6k_7k_8}\Omega^{04}_{k_5k_6k_1k_2}\Omega^{04}_{k_7k_8k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_1k_2k_5k_6}\ \epsilon_{k_3k_4k_7k_8}}\end{aligned} \tag{7}$$



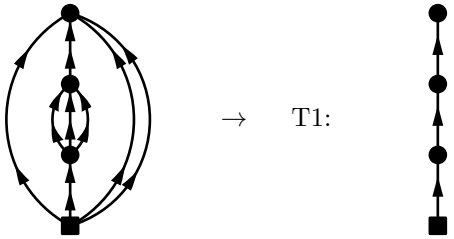
$\rightarrow$ T2:

$$\mathrm{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{8}$$

$$a_1 = \epsilon^{k_5k_6k_7k_8}$$
$$a_2 = \epsilon_{k_1k_2k_5k_6}$$
$$a_3 = \epsilon_{k_3k_4k_7k_8}$$

Diagram 3:

$$\begin{aligned}\mathrm{PO4.3} &= \lim_{\tau\to\infty}\frac{(-1)^3}{(3!)^2}\sum_{k_i} O^{40}_{k_1k_2k_3k_4}\Omega^{31}_{k_5k_6k_7k_1}\Omega^{13}_{k_8k_5k_6k_7}\Omega^{04}_{k_8k_2k_3k_4}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2)e^{-\tau_1\epsilon^{k_5k_6k_7}_{k_1}}e^{-\tau_2\epsilon^{k_8}_{k_5k_6k_7}}e^{-\tau_3\epsilon_{k_2k_3k_4k_8}} \\ &= \frac{(-1)^3}{(3!)^2}\sum_{k_i}\frac{O^{40}_{k_1k_2k_3k_4}\Omega^{31}_{k_5k_6k_7k_1}\Omega^{13}_{k_8k_5k_6k_7}\Omega^{04}_{k_8k_2k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_5k_6k_7k_2k_3k_4}\ \epsilon_{k_2k_3k_4k_8}}\end{aligned} \tag{9}$$



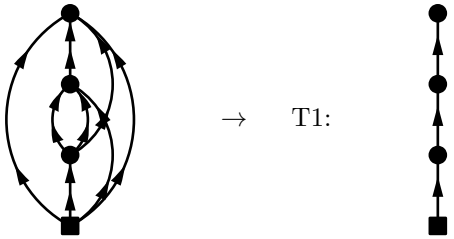
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{10}$$

$$a_1 = \epsilon^{k_5 k_6 k_7}_{k_1}$$
$$a_2 = \epsilon^{k_8}_{k_5 k_6 k_7}$$
$$a_3 = \epsilon_{k_2 k_3 k_4 k_8}$$

Diagram 4:

$$\mathrm{PO4.4} = \lim_{\tau\to\infty} \frac{-(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{31}_{k_5 k_6 k_7 k_1} \Omega^{13}_{k_8 k_5 k_6 k_2} \Omega^{04}_{k_8 k_7 k_3 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5 k_6 k_7}_{k_1}} e^{-\tau_2 \epsilon^{k_8}_{k_2 k_5 k_6}} e^{-\tau_3 \epsilon_{k_3 k_4 k_7 k_8}}$$
$$= \frac{-(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{31}_{k_5 k_6 k_7 k_1} \Omega^{13}_{k_8 k_5 k_6 k_2} \Omega^{04}_{k_8 k_7 k_3 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_2 k_5 k_6 k_3 k_4 k_7}\ \epsilon_{k_3 k_4 k_7 k_8}} \tag{11}$$



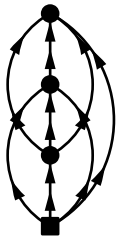
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{12}$$

$$a_1 = \epsilon^{k_5 k_6 k_7}_{k_1}$$
$$a_2 = \epsilon^{k_8}_{k_2 k_5 k_6}$$
$$a_3 = \epsilon_{k_3 k_4 k_7 k_8}$$

Diagram 5:

$$\mathrm{PO4.5} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{31}_{k_5 k_6 k_7 k_1} \Omega^{13}_{k_8 k_5 k_2 k_3} \Omega^{04}_{k_8 k_6 k_7 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5 k_6 k_7}_{k_1}} e^{-\tau_2 \epsilon^{k_8}_{k_2 k_3 k_5}} e^{-\tau_3 \epsilon_{k_4 k_6 k_7 k_8}}$$
$$= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{31}_{k_5 k_6 k_7 k_1} \Omega^{13}_{k_8 k_5 k_2 k_3} \Omega^{04}_{k_8 k_6 k_7 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_2 k_3 k_5 k_4 k_6 k_7}\ \epsilon_{k_4 k_6 k_7 k_8}} \tag{13}$$



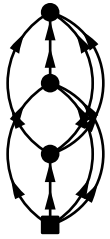
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{14}$$

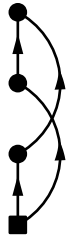
$$a_1 = \epsilon_{k_1}^{k_5k_6k_7}$$
$$a_2 = \epsilon_{k_2k_3k_5}^{k_8}$$
$$a_3 = \epsilon_{k_4k_6k_7k_8}$$

Diagram 6:

$$\mathrm{PO4.6} = \lim_{\tau\to\infty} \frac{-(-1)^3}{(3!)^2} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{13}_{k_8k_2k_3k_4} \Omega^{04}_{k_8k_5k_6k_7} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon_{k_1}^{k_5k_6k_7}} e^{-\tau_2 \epsilon_{k_2k_3k_4}^{k_8}} e^{-\tau_3 \epsilon_{k_5k_6k_7k_8}}$$
$$= \frac{-(-1)^3}{(3!)^2} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{13}_{k_8k_2k_3k_4} \Omega^{04}_{k_8k_5k_6k_7} \left[\frac{1}{\epsilon_{k_1k_8}\ \epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_5k_6k_7k_8}} + \frac{1}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_2k_3k_4k_5k_6k_7}\ \epsilon_{k_5k_6k_7k_8}} \right] \tag{15}$$



$\rightarrow$ T4:

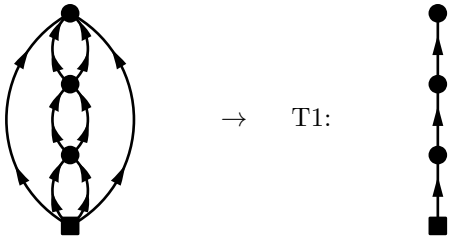


$$\mathrm{T4} = \frac{1}{(a_1+a_3)(a_2+a_1+a_3)a_3} + \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{16}$$

$$a_1 = \epsilon^{k_5 k_6 k_7}_{k_1}$$
$$a_2 = \epsilon^{k_8}_{k_2 k_3 k_4}$$
$$a_3 = \epsilon_{k_5 k_6 k_7 k_8}$$

Diagram 7:

$$\text{PO4.7} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^4} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{22}_{k_7 k_8 k_5 k_6} \Omega^{04}_{k_7 k_8 k_3 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5 k_6}_{k_1 k_2}} e^{-\tau_2 \epsilon^{k_7 k_8}_{k_5 k_6}} e^{-\tau_3 \epsilon_{k_3 k_4 k_7 k_8}}$$
$$= \frac{(-1)^3}{(2!)^4} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{22}_{k_7 k_8 k_5 k_6} \Omega^{04}_{k_7 k_8 k_3 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_5 k_6 k_3 k_4}\ \epsilon_{k_3 k_4 k_7 k_8}} \tag{17}$$

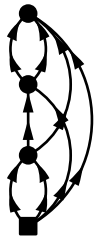


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{18}$$

$$a_1 = \epsilon^{k_5 k_6}_{k_1 k_2}$$
$$a_2 = \epsilon^{k_7 k_8}_{k_5 k_6}$$
$$a_3 = \epsilon_{k_3 k_4 k_7 k_8}$$

Diagram 8:

$$\text{PO4.8} = \lim_{\tau\to\infty} \frac{-(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{22}_{k_7 k_8 k_5 k_3} \Omega^{04}_{k_7 k_8 k_6 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5 k_6}_{k_1 k_2}} e^{-\tau_2 \epsilon^{k_7 k_8}_{k_3 k_5}} e^{-\tau_3 \epsilon_{k_4 k_6 k_7 k_8}}$$
$$= \frac{-(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{22}_{k_7 k_8 k_5 k_3} \Omega^{04}_{k_7 k_8 k_6 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_3 k_5 k_4 k_6}\ \epsilon_{k_4 k_6 k_7 k_8}} \tag{19}$$



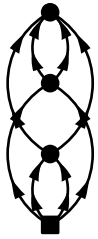
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{20}$$

$$\begin{aligned} a_1 &= \epsilon^{k_5k_6}_{k_1k_2} \\ a_2 &= \epsilon^{k_7k_8}_{k_3k_5} \\ a_3 &= \epsilon_{k_4k_6k_7k_8} \end{aligned}$$

Diagram 9:

$$\begin{aligned} \mathrm{PO4.9} &= \lim_{\tau\to\infty} \frac{(-1)^3}{2(2!)^4} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{22}_{k_5k_6k_1k_2} \Omega^{22}_{k_7k_8k_3k_4} \Omega^{04}_{k_7k_8k_5k_6} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5k_6}_{k_1k_2}} e^{-\tau_2 \epsilon^{k_7k_8}_{k_3k_4}} e^{-\tau_3 \epsilon_{k_5k_6k_7k_8}} \\ &= \frac{(-1)^3}{2(2!)^4} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{22}_{k_5k_6k_1k_2} \Omega^{22}_{k_7k_8k_3k_4} \Omega^{04}_{k_7k_8k_5k_6} \left[\frac{1}{\epsilon_{k_1k_2k_7k_8}\ \epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_5k_6k_7k_8}} + \frac{1}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_3k_4k_5k_6}\ \epsilon_{k_5k_6k_7k_8}} \right] \end{aligned} \tag{21}$$



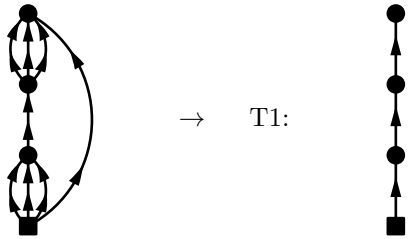
$\rightarrow$ T4:

$$\mathrm{T4} = \frac{1}{(a_1+a_3)(a_2+a_1+a_3)a_3} + \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{22}$$

$$
\begin{aligned}
a_1 &= \epsilon^{k_5 k_6}_{k_1 k_2} \\
a_2 &= \epsilon^{k_7 k_8}_{k_3 k_4} \\
a_3 &= \epsilon_{k_5 k_6 k_7 k_8}
\end{aligned}
$$

Diagram 10:

$$
\begin{aligned}
\mathrm{PO4.10} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(3!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{13}_{k_5 k_1 k_2 k_3} \Omega^{31}_{k_6 k_7 k_8 k_5} \Omega^{04}_{k_6 k_7 k_8 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1 k_2 k_3}} e^{-\tau_2 \epsilon^{k_6 k_7 k_8}_{k_5}} e^{-\tau_3 \epsilon_{k_4 k_6 k_7 k_8}} \\
&= \frac{(-1)^3}{(3!)^2} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{13}_{k_5 k_1 k_2 k_3} \Omega^{31}_{k_6 k_7 k_8 k_5} \Omega^{04}_{k_6 k_7 k_8 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_5 k_4}\ \epsilon_{k_4 k_6 k_7 k_8}}
\end{aligned} \tag{23}
$$



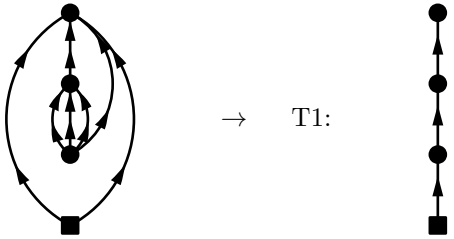
$$
\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{24}
$$

$$
\begin{aligned}
a_1 &= \epsilon^{k_5}_{k_1 k_2 k_3} \\
a_2 &= \epsilon^{k_6 k_7 k_8}_{k_5} \\
a_3 &= \epsilon_{k_4 k_6 k_7 k_8}
\end{aligned}
$$

2.2 Two-body canonical diagrams for a generic operator only

Diagram 11:

$$\begin{aligned}\mathrm{PO4.11} &= \lim_{\tau\to\infty}\frac{(-1)^3}{(2!)(3!)}\sum_{k_i} O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{13}_{k_7k_3k_4k_5}\Omega^{04}_{k_7k_6k_1k_2}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2)e^{-\tau_1\epsilon^{k_3k_4k_5k_6}}e^{-\tau_2\epsilon^{k_7}_{k_3k_4k_5}}e^{-\tau_3\epsilon_{k_1k_2k_6k_7}}\\ &= \frac{(-1)^3}{(2!)(3!)}\sum_{k_i}\frac{O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{13}_{k_7k_3k_4k_5}\Omega^{04}_{k_7k_6k_1k_2}}{\epsilon_{k_1k_2}\ \epsilon_{k_3k_4k_5k_1k_2k_6}\ \epsilon_{k_1k_2k_6k_7}}\end{aligned} \tag{25}$$

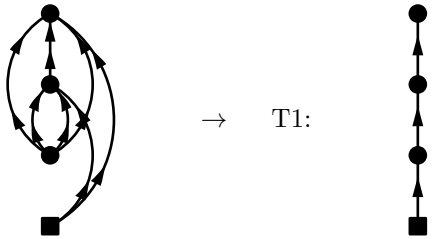


$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{26}$$

$$\begin{aligned}a_1 &= \epsilon^{k_3k_4k_5k_6}\\ a_2 &= \epsilon^{k_7}_{k_3k_4k_5}\\ a_3 &= \epsilon_{k_1k_2k_6k_7}\end{aligned}$$

Diagram 12:

$$\begin{aligned}\mathrm{PO4.12} &= \lim_{\tau\to\infty}\frac{(-1)^3}{(2!)^2}\sum_{k_i} O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{13}_{k_7k_3k_4k_1}\Omega^{04}_{k_7k_5k_6k_2}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2)e^{-\tau_1\epsilon^{k_3k_4k_5k_6}}e^{-\tau_2\epsilon^{k_7}_{k_1k_3k_4}}e^{-\tau_3\epsilon_{k_2k_5k_6k_7}}\\ &= \frac{(-1)^3}{(2!)^2}\sum_{k_i}\frac{O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{13}_{k_7k_3k_4k_1}\Omega^{04}_{k_7k_5k_6k_2}}{\epsilon_{k_1k_2}\ \epsilon_{k_1k_3k_4k_2k_5k_6}\ \epsilon_{k_2k_5k_6k_7}}\end{aligned} \tag{27}$$



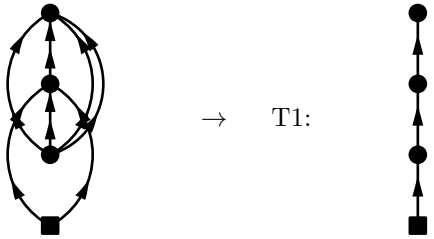
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{28}$$

$$a_1 = \epsilon^{k_3k_4k_5k_6}$$
$$a_2 = \epsilon^{k_7}_{k_1k_3k_4}$$
$$a_3 = \epsilon_{k_2k_5k_6k_7}$$

Diagram 13:

$$\mathrm{PO4.13} = \lim_{\tau\to\infty}\frac{(-1)^3}{(2!)(3!)}\sum_{k_i} O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{13}_{k_7k_3k_1k_2}\Omega^{04}_{k_7k_4k_5k_6}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2)e^{-\tau_1\epsilon^{k_3k_4k_5k_6}}e^{-\tau_2\epsilon^{k_7}_{k_1k_2k_3}}e^{-\tau_3\epsilon_{k_4k_5k_6k_7}}$$
$$= \frac{(-1)^3}{(2!)(3!)}\sum_{k_i}\frac{O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{13}_{k_7k_3k_1k_2}\Omega^{04}_{k_7k_4k_5k_6}}{\epsilon_{k_1k_2}\ \epsilon_{k_1k_2k_3k_4k_5k_6}\ \epsilon_{k_4k_5k_6k_7}} \tag{29}$$



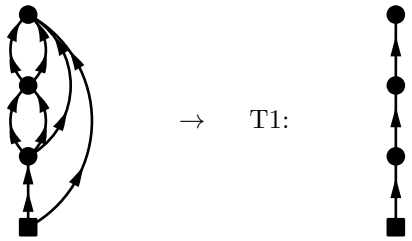
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{30}$$

$$a_1 = \epsilon^{k_3 k_4 k_5 k_6}$$
$$a_2 = \epsilon^{k_7}_{k_1 k_2 k_3}$$
$$a_3 = \epsilon_{k_4 k_5 k_6 k_7}$$

Diagram 14:

$$\text{PO4.14} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{22}_{k_6 k_7 k_3 k_4} \Omega^{04}_{k_6 k_7 k_5 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3 k_4 k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6 k_7}_{k_3 k_4}} e^{-\tau_3 \epsilon_{k_2 k_5 k_6 k_7}}$$
$$= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{22}_{k_6 k_7 k_3 k_4} \Omega^{04}_{k_6 k_7 k_5 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_3 k_4 k_2 k_5}\ \epsilon_{k_2 k_5 k_6 k_7}} \tag{31}$$

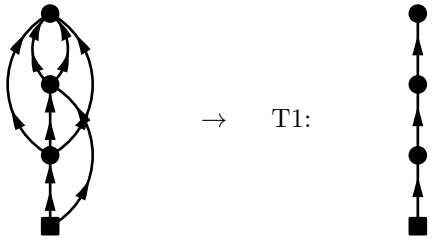


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{32}$$

$$a_1 = \epsilon^{k_3 k_4 k_5}_{k_1}$$
$$a_2 = \epsilon^{k_6 k_7}_{k_3 k_4}$$
$$a_3 = \epsilon_{k_2 k_5 k_6 k_7}$$

Diagram 15:

$$\text{PO4.15} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{22}_{k_6 k_7 k_3 k_2} \Omega^{04}_{k_6 k_7 k_4 k_5} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3 k_4 k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6 k_7}_{k_2 k_3}} e^{-\tau_3 \epsilon_{k_4 k_5 k_6 k_7}}$$
$$= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{22}_{k_6 k_7 k_3 k_2} \Omega^{04}_{k_6 k_7 k_4 k_5}}{\epsilon_{k_1 k_2}\ \epsilon_{k_2 k_3 k_4 k_5}\ \epsilon_{k_4 k_5 k_6 k_7}} \tag{33}$$

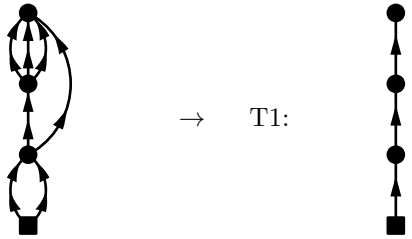


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{34}$$

$$\begin{aligned} a_1 &= \epsilon^{k_3k_4k_5}_{k_1} \\ a_2 &= \epsilon^{k_6k_7}_{k_2k_3} \\ a_3 &= \epsilon_{k_4k_5k_6k_7} \end{aligned}$$

Diagram 16:

$$\begin{aligned} \text{PO4.16} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} O^{20}_{k_1k_2} \Omega^{22}_{k_3k_4k_1k_2} \Omega^{31}_{k_5k_6k_7k_3} \Omega^{04}_{k_5k_6k_7k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3k_4}_{k_1k_2}} e^{-\tau_2 \epsilon^{k_5k_6k_7}_{k_3}} e^{-\tau_3 \epsilon_{k_4k_5k_6k_7}} \\ &= \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} \frac{O^{20}_{k_1k_2} \Omega^{22}_{k_3k_4k_1k_2} \Omega^{31}_{k_5k_6k_7k_3} \Omega^{04}_{k_5k_6k_7k_4}}{\epsilon_{k_1k_2}\ \epsilon_{k_3k_4}\ \epsilon_{k_4k_5k_6k_7}} \end{aligned} \tag{35}$$



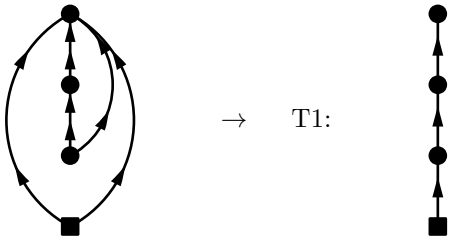
$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{36}$$

$$a_1 = \epsilon^{k_3 k_4}_{k_1 k_2}$$
$$a_2 = \epsilon^{k_5 k_6 k_7}_{k_3}$$
$$a_3 = \epsilon_{k_4 k_5 k_6 k_7}$$

2.3 Two-body non-canonical diagrams

Diagram 17:

$$\begin{aligned}\text{PO4.17} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{11}_{k_5 k_3} \Omega^{04}_{k_5 k_4 k_1 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}} e^{-\tau_2 \epsilon^{k_5}_{k_3}} e^{-\tau_3 \epsilon_{k_1 k_2 k_4 k_5}} \\ &= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{11}_{k_5 k_3} \Omega^{04}_{k_5 k_4 k_1 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_3 k_1 k_2 k_4}\ \epsilon_{k_1 k_2 k_4 k_5}} \end{aligned} \tag{37}$$

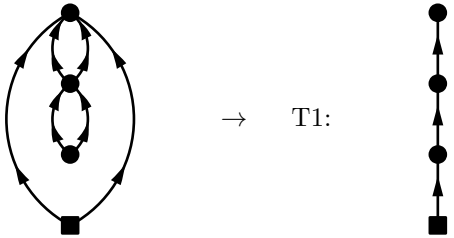


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{38}$$

$$a_1 = \epsilon^{k_3 k_4}$$
$$a_2 = \epsilon^{k_5}_{k_3}$$
$$a_3 = \epsilon_{k_1 k_2 k_4 k_5}$$

Diagram 18:

$$\begin{aligned}\mathrm{PO4.18} &= \lim_{\tau\to\infty}\frac{(-1)^3}{(2!)^3}\sum_{k_i} O^{20}_{k_1k_2}\Omega^{20}_{k_3k_4}\Omega^{22}_{k_5k_6k_3k_4}\Omega^{04}_{k_5k_6k_1k_2}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2)e^{-\tau_1\epsilon^{k_3k_4}}e^{-\tau_2\epsilon^{k_5k_6}_{k_3k_4}}e^{-\tau_3\epsilon_{k_1k_2k_5k_6}} \\ &= \frac{(-1)^3}{(2!)^3}\sum_{k_i}\frac{O^{20}_{k_1k_2}\Omega^{20}_{k_3k_4}\Omega^{22}_{k_5k_6k_3k_4}\Omega^{04}_{k_5k_6k_1k_2}}{\epsilon_{k_1k_2}\ \epsilon_{k_3k_4k_1k_2}\ \epsilon_{k_1k_2k_5k_6}} \end{aligned} \tag{39}$$

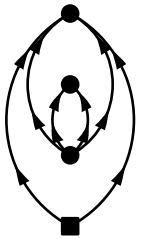


$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{40}$$

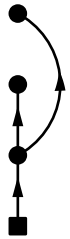
$$\begin{aligned} a_1 &= \epsilon^{k_3k_4} \\ a_2 &= \epsilon^{k_5k_6}_{k_3k_4} \\ a_3 &= \epsilon_{k_1k_2k_5k_6} \end{aligned}$$

Diagram 19:

$$\begin{aligned}\mathrm{PO4.19} &= \lim_{\tau\to\infty}\frac{(-1)^3}{(2!)^3}\sum_{k_i} O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{02}_{k_3k_4}\Omega^{04}_{k_5k_6k_1k_2}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)e^{-\tau_1\epsilon^{k_3k_4k_5k_6}}e^{-\tau_2\epsilon_{k_3k_4}}e^{-\tau_3\epsilon_{k_1k_2k_5k_6}} \\ &= \frac{(-1)^3}{(2!)^3}\sum_{k_i}\frac{O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{02}_{k_3k_4}\Omega^{04}_{k_5k_6k_1k_2}}{\epsilon_{k_1k_2}\ \epsilon_{k_3k_4}\ \epsilon_{k_1k_2k_5k_6}} \end{aligned} \tag{41}$$



$\rightarrow$ T2:

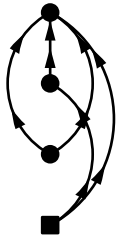


$$\mathrm{T2} = \frac{1}{(a_1 + a_2 + a_3)a_2 a_3} \tag{42}$$

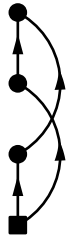
$$a_1 = \epsilon^{k_3 k_4 k_5 k_6}$$
$$a_2 = \epsilon_{k_3 k_4}$$
$$a_3 = \epsilon_{k_1 k_2 k_5 k_6}$$

Diagram 20:

$$\mathrm{PO4.20} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{04}_{k_5 k_3 k_4 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}} e^{-\tau_2 \epsilon^{k_5}_{k_1}} e^{-\tau_3 \epsilon_{k_2 k_3 k_4 k_5}}$$
$$= \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{04}_{k_5 k_3 k_4 k_2} \left[\frac{1}{\epsilon_{k_2 k_5}\ \epsilon_{k_1 k_2}\ \epsilon_{k_2 k_3 k_4 k_5}} + \frac{1}{\epsilon_{k_1 k_2}\ \epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_2 k_3 k_4 k_5}} \right] \tag{43}$$



$\rightarrow$ T4:

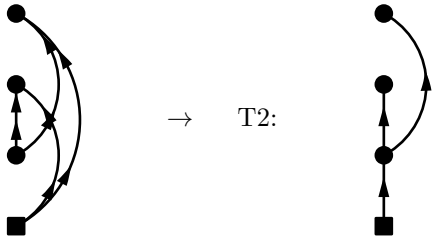


$$\mathrm{T4} = \frac{1}{(a_1 + a_3)(a_2 + a_1 + a_3)a_3} + \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{44}$$

$$a_1 = \epsilon^{k_3 k_4}$$
$$a_2 = \epsilon^{k_5}_{k_1}$$
$$a_3 = \epsilon_{k_2 k_3 k_4 k_5}$$

Diagram 21:

$$\text{PO4.21} = \lim_{\tau\to\infty} \frac{-(-1)^3}{2} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{02}_{k_3 k_1} \Omega^{02}_{k_4 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_1) e^{-\tau_1 \epsilon^{k_3 k_4}} e^{-\tau_2 \epsilon_{k_1 k_3}} e^{-\tau_3 \epsilon_{k_2 k_4}}$$
$$= \frac{-(-1)^3}{2} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{02}_{k_3 k_1} \Omega^{02}_{k_4 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_1 k_3}\ \epsilon_{k_2 k_4}} \tag{45}$$

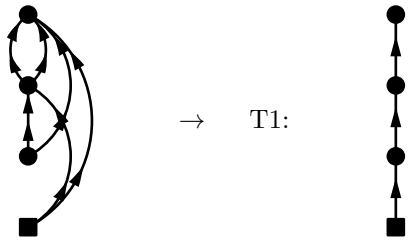


$$\text{T2} = \frac{1}{(a_1 + a_2 + a_3) a_2 a_3} \tag{46}$$

$$a_1 = \epsilon^{k_3 k_4}$$
$$a_2 = \epsilon_{k_1 k_3}$$
$$a_3 = \epsilon_{k_2 k_4}$$

Diagram 22:

$$\text{PO4.22} = \lim_{\tau\to\infty} \frac{-(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{22}_{k_5 k_6 k_3 k_1} \Omega^{04}_{k_5 k_6 k_4 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}} e^{-\tau_2 \epsilon^{k_5 k_6}_{k_1 k_3}} e^{-\tau_3 \epsilon_{k_2 k_4 k_5 k_6}}$$
$$= \frac{-(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{22}_{k_5 k_6 k_3 k_1} \Omega^{04}_{k_5 k_6 k_4 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_1 k_3 k_2 k_4}\ \epsilon_{k_2 k_4 k_5 k_6}} \tag{47}$$



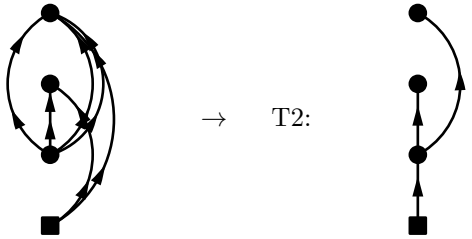
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{48}$$

$$\begin{aligned} a_1 &= \epsilon^{k_3k_4} \\ a_2 &= \epsilon^{k_5k_6}_{k_1k_3} \\ a_3 &= \epsilon_{k_2k_4k_5k_6} \end{aligned}$$

Diagram 23:

$$\begin{aligned} \mathrm{PO4.23} &= \lim_{\tau\to\infty} \frac{-(-1)^3}{(3!)} \sum_{k_i} O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{02}_{k_3k_1}\Omega^{04}_{k_4k_5k_6k_2} \int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)e^{-\tau_1\epsilon^{k_3k_4k_5k_6}}e^{-\tau_2\epsilon_{k_1k_3}}e^{-\tau_3\epsilon_{k_2k_4k_5k_6}} \\ &= \frac{-(-1)^3}{(3!)} \sum_{k_i} \frac{O^{20}_{k_1k_2}\Omega^{40}_{k_3k_4k_5k_6}\Omega^{02}_{k_3k_1}\Omega^{04}_{k_4k_5k_6k_2}}{\epsilon_{k_1k_2}\ \epsilon_{k_1k_3}\ \epsilon_{k_2k_4k_5k_6}} \end{aligned} \tag{49}$$



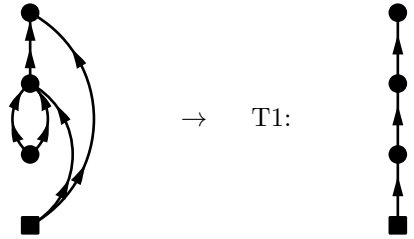
$\rightarrow$ T2:

$$\mathrm{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{50}$$

$$a_1 = \epsilon^{k_3 k_4 k_5 k_6}$$
$$a_2 = \epsilon_{k_1 k_3}$$
$$a_3 = \epsilon_{k_2 k_4 k_5 k_6}$$

Diagram 24:

$$\text{PO4.24} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{13}_{k_5 k_3 k_4 k_1} \Omega^{02}_{k_5 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}} e^{-\tau_2 \epsilon^{k_5}_{k_1 k_3 k_4}} e^{-\tau_3 \epsilon_{k_2 k_5}}$$
$$= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{13}_{k_5 k_3 k_4 k_1} \Omega^{02}_{k_5 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_1 k_3 k_4 k_2}\ \epsilon_{k_2 k_5}} \tag{51}$$



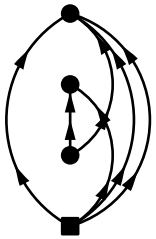
$\rightarrow$ T1:

$$\text{T1} = \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{52}$$

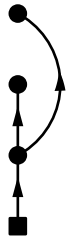
$$a_1 = \epsilon^{k_3 k_4}$$
$$a_2 = \epsilon^{k_5}_{k_1 k_3 k_4}$$
$$a_3 = \epsilon_{k_2 k_5}$$

Diagram 25:

$$\text{PO4.25} = \lim_{\tau\to\infty} \frac{-(-1)^3}{(3!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{20}_{k_5 k_6} \Omega^{02}_{k_5 k_1} \Omega^{04}_{k_6 k_2 k_3 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_1) e^{-\tau_1 \epsilon^{k_5 k_6}} e^{-\tau_2 \epsilon_{k_1 k_5}} e^{-\tau_3 \epsilon_{k_2 k_3 k_4 k_6}}$$
$$= \frac{-(-1)^3}{(3!)} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{20}_{k_5 k_6} \Omega^{02}_{k_5 k_1} \Omega^{04}_{k_6 k_2 k_3 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_1 k_5}\ \epsilon_{k_2 k_3 k_4 k_6}} \tag{53}$$



$\rightarrow$ T2:

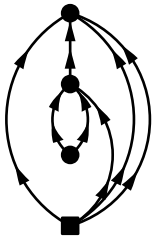


$$\mathrm{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{54}$$

$$\begin{aligned} a_1 &= \epsilon^{k_5k_6} \\ a_2 &= \epsilon_{k_1k_5} \\ a_3 &= \epsilon_{k_2k_3k_4k_6} \end{aligned}$$

Diagram 26:

$$\begin{aligned} \mathrm{PO4.26} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{20}_{k_5k_6} \Omega^{13}_{k_7k_5k_6k_1} \Omega^{04}_{k_7k_2k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1\epsilon^{k_5k_6}} e^{-\tau_2\epsilon^{k_7}_{k_1k_5k_6}} e^{-\tau_3\epsilon_{k_2k_3k_4k_7}} \\ &= \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{20}_{k_5k_6} \Omega^{13}_{k_7k_5k_6k_1} \Omega^{04}_{k_7k_2k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_1k_5k_6k_2k_3k_4}\ \epsilon_{k_2k_3k_4k_7}} \end{aligned} \tag{55}$$



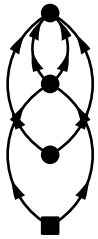
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{56}$$

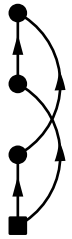
$$
\begin{aligned}
a_1 &= \epsilon^{k_5 k_6} \\
a_2 &= \epsilon^{k_7}_{k_1 k_5 k_6} \\
a_3 &= \epsilon_{k_2 k_3 k_4 k_7}
\end{aligned}
$$

Diagram 27:

$$
\begin{aligned}
\mathrm{PO4.27} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^3} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{04}_{k_5 k_6 k_3 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}} e^{-\tau_2 \epsilon^{k_5 k_6}_{k_1 k_2}} e^{-\tau_3 \epsilon_{k_3 k_4 k_5 k_6}} \\
&= \frac{(-1)^3}{(2!)^3} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{04}_{k_5 k_6 k_3 k_4} \left[\frac{1}{\epsilon_{k_5 k_6}\ \epsilon_{k_1 k_2}\ \epsilon_{k_3 k_4 k_5 k_6}} + \frac{1}{\epsilon_{k_1 k_2}\ \epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_3 k_4 k_5 k_6}} \right]
\end{aligned} \tag{57}
$$



$\rightarrow$ T4:

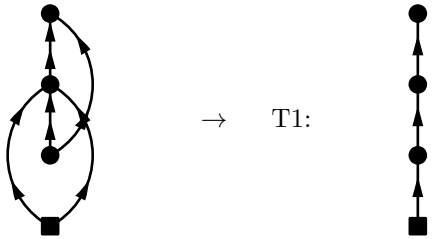


$$
\mathrm{T4} = \frac{1}{(a_1+a_3)(a_2+a_1+a_3)a_3} + \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{58}
$$

$$
\begin{aligned}
a_1 &= \epsilon^{k_3 k_4} \\
a_2 &= \epsilon^{k_5 k_6}_{k_1 k_2} \\
a_3 &= \epsilon_{k_3 k_4 k_5 k_6}
\end{aligned}
$$

Diagram 28:

$$
\begin{aligned}
\mathrm{PO4.28} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{13}_{k_5 k_3 k_1 k_2} \Omega^{02}_{k_5 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}} e^{-\tau_2 \epsilon^{k_5}_{k_1 k_2 k_3}} e^{-\tau_3 \epsilon_{k_4 k_5}} \\
&= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{20}_{k_3 k_4} \Omega^{13}_{k_5 k_3 k_1 k_2} \Omega^{02}_{k_5 k_4}}{\epsilon_{k_1 k_2}\ \epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_4 k_5}}
\end{aligned} \tag{59}
$$



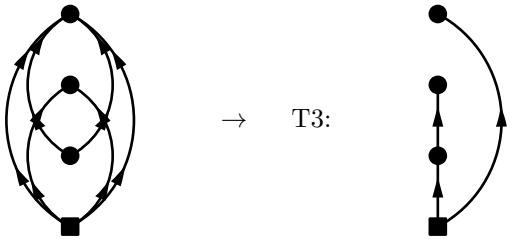
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{60}$$

$$\begin{aligned} a_1 &= \epsilon^{k_3k_4} \\ a_2 &= \epsilon^{k_5}_{k_1k_2k_3} \\ a_3 &= \epsilon_{k_4k_5} \end{aligned}$$

Diagram 29:

$$\begin{aligned} \mathrm{PO4.29} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^3} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{20}_{k_5k_6} \Omega^{02}_{k_1k_2} \Omega^{04}_{k_5k_6k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3-\tau_1) e^{-\tau_1 \epsilon^{k_5k_6}} e^{-\tau_2 \epsilon_{k_1k_2}} e^{-\tau_3 \epsilon_{k_3k_4k_5k_6}} \\ &= \frac{(-1)^3}{(2!)^3} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{20}_{k_5k_6} \Omega^{02}_{k_1k_2} \Omega^{04}_{k_5k_6k_3k_4}}{\epsilon_{k_3k_4}\ \epsilon_{k_1k_2}\ \epsilon_{k_3k_4k_5k_6}} \end{aligned} \tag{61}$$



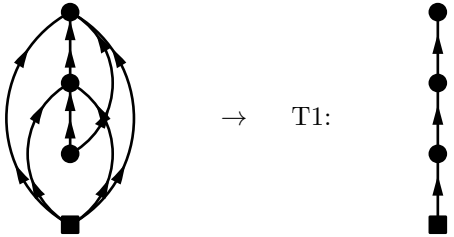
$\rightarrow$ T3:

$$\mathrm{T3} = \frac{1}{(a_1+a_2)a_2a_3} \tag{62}$$

$$a_1 = \epsilon^{k_5 k_6}$$
$$a_2 = \epsilon_{k_3 k_4 k_5 k_6}$$
$$a_3 = \epsilon_{k_1 k_2}$$

Diagram 30:

$$\begin{aligned}\text{PO4.30} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{20}_{k_5 k_6} \Omega^{13}_{k_7 k_5 k_1 k_2} \Omega^{04}_{k_7 k_6 k_3 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5 k_6}} e^{-\tau_2 \epsilon^{k_7}_{k_1 k_2 k_5}} e^{-\tau_3 \epsilon_{k_3 k_4 k_6 k_7}} \\ &= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{20}_{k_5 k_6} \Omega^{13}_{k_7 k_5 k_1 k_2} \Omega^{04}_{k_7 k_6 k_3 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_1 k_2 k_5 k_3 k_4 k_6}\ \epsilon_{k_3 k_4 k_6 k_7}} \end{aligned} \tag{63}$$

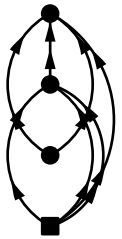


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{64}$$

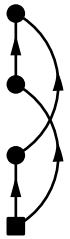
$$a_1 = \epsilon^{k_5 k_6}$$
$$a_2 = \epsilon^{k_7}_{k_1 k_2 k_5}$$
$$a_3 = \epsilon_{k_3 k_4 k_6 k_7}$$

Diagram 31:

$$\begin{aligned}\text{PO4.31} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{20}_{k_5 k_6} \Omega^{13}_{k_7 k_1 k_2 k_3} \Omega^{04}_{k_7 k_5 k_6 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5 k_6}} e^{-\tau_2 \epsilon^{k_7}_{k_1 k_2 k_3}} e^{-\tau_3 \epsilon_{k_4 k_5 k_6 k_7}} \\ &= \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{20}_{k_5 k_6} \Omega^{13}_{k_7 k_1 k_2 k_3} \Omega^{04}_{k_7 k_5 k_6 k_4} \left[\frac{1}{\epsilon_{k_4 k_7}\ \epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_4 k_5 k_6 k_7}} + \frac{1}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_1 k_2 k_3 k_4 k_5 k_6}\ \epsilon_{k_4 k_5 k_6 k_7}} \right] \end{aligned} \tag{65}$$



$\rightarrow$ T4:

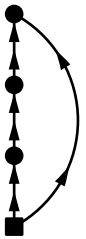


$$\mathrm{T4} = \frac{1}{(a_1+a_3)(a_2+a_1+a_3)a_3} + \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{66}$$

$$\begin{aligned} a_1 &= \epsilon^{k_5 k_6} \\ a_2 &= \epsilon^{k_7}_{k_1 k_2 k_3} \\ a_3 &= \epsilon_{k_4 k_5 k_6 k_7} \end{aligned}$$

Diagram 32:

$$\begin{aligned} \mathrm{PO4.32} &= \lim_{\tau\to\infty} (-1)^3 \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{11}_{k_4 k_3} \Omega^{02}_{k_4 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3}_{k_1}} e^{-\tau_2 \epsilon^{k_4}_{k_3}} e^{-\tau_3 \epsilon_{k_2 k_4}} \\ &= (-1)^3 \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{11}_{k_4 k_3} \Omega^{02}_{k_4 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_3 k_2}\ \epsilon_{k_2 k_4}} \end{aligned} \tag{67}$$



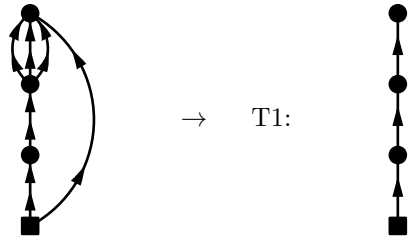
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{68}$$

$$a_1 = \epsilon_{k_1}^{k_3}$$
$$a_2 = \epsilon_{k_3}^{k_4}$$
$$a_3 = \epsilon_{k_2 k_4}$$

Diagram 33:

$$\text{PO4.33} = \lim_{\tau\to\infty} \frac{(-1)^3}{(3!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{31}_{k_4 k_5 k_6 k_3} \Omega^{04}_{k_4 k_5 k_6 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_3}_{k_1}} e^{-\tau_2 \epsilon^{k_4 k_5 k_6}_{k_3}} e^{-\tau_3 \epsilon_{k_2 k_4 k_5 k_6}}$$
$$= \frac{(-1)^3}{(3!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{31}_{k_4 k_5 k_6 k_3} \Omega^{04}_{k_4 k_5 k_6 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_3 k_2}\ \epsilon_{k_2 k_4 k_5 k_6}} \tag{69}$$



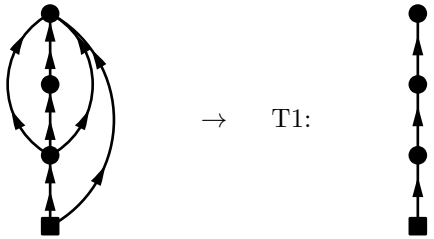
$\rightarrow$ T1:

$$\text{T1} = \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{70}$$

$$a_1 = \epsilon_{k_1}^{k_3}$$
$$a_2 = \epsilon_{k_3}^{k_4 k_5 k_6}$$
$$a_3 = \epsilon_{k_2 k_4 k_5 k_6}$$

Diagram 34:

$$\text{PO4.34} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{11}_{k_6 k_3} \Omega^{04}_{k_6 k_4 k_5 k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_3 k_4 k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6}_{k_3}} e^{-\tau_3 \epsilon_{k_2 k_4 k_5 k_6}}$$
$$= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{11}_{k_6 k_3} \Omega^{04}_{k_6 k_4 k_5 k_2}}{\epsilon_{k_1 k_2}\ \epsilon_{k_3 k_2 k_4 k_5}\ \epsilon_{k_2 k_4 k_5 k_6}} \tag{71}$$



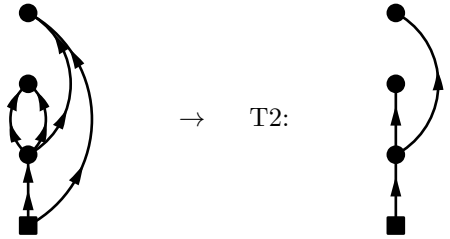
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{72}$$

$$\begin{aligned} a_1 &= \epsilon_{k_1}^{k_3k_4k_5} \\ a_2 &= \epsilon_{k_3}^{k_6} \\ a_3 &= \epsilon_{k_2k_4k_5k_6} \end{aligned}$$

Diagram 35:

$$\begin{aligned} \mathrm{PO4.35} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1k_2} \Omega^{31}_{k_3k_4k_5k_1} \Omega^{02}_{k_3k_4} \Omega^{02}_{k_5k_2} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1) e^{-\tau_1 \epsilon_{k_1}^{k_3k_4k_5}} e^{-\tau_2\epsilon_{k_3k_4}} e^{-\tau_3\epsilon_{k_2k_5}} \\ &= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1k_2} \Omega^{31}_{k_3k_4k_5k_1} \Omega^{02}_{k_3k_4} \Omega^{02}_{k_5k_2}}{\epsilon_{k_1k_2}\ \epsilon_{k_3k_4}\ \epsilon_{k_2k_5}} \end{aligned} \tag{73}$$



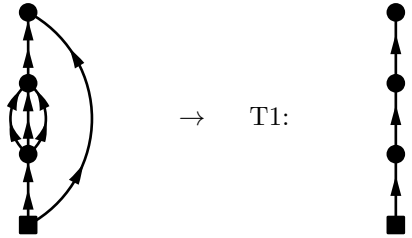
$\rightarrow$ T2:

$$\mathrm{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{74}$$

$$a_1 = \epsilon^{k_3k_4k_5}_{k_1}$$
$$a_2 = \epsilon_{k_3k_4}$$
$$a_3 = \epsilon_{k_2k_5}$$

Diagram 36:

$$\begin{aligned}\text{PO4.36} &= \lim_{\tau\to\infty}\frac{(-1)^3}{(3!)}\sum_{k_i} O^{20}_{k_1k_2}\Omega^{31}_{k_3k_4k_5k_1}\Omega^{13}_{k_6k_3k_4k_5}\Omega^{02}_{k_6k_2}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2)e^{-\tau_1\epsilon^{k_3k_4k_5}_{k_1}}e^{-\tau_2\epsilon^{k_6}_{k_3k_4k_5}}e^{-\tau_3\epsilon_{k_2k_6}}\\ &= \frac{(-1)^3}{(3!)}\sum_{k_i}\frac{O^{20}_{k_1k_2}\Omega^{31}_{k_3k_4k_5k_1}\Omega^{13}_{k_6k_3k_4k_5}\Omega^{02}_{k_6k_2}}{\epsilon_{k_1k_2}\ \epsilon_{k_3k_4k_5k_2}\ \epsilon_{k_2k_6}}\end{aligned} \tag{75}$$

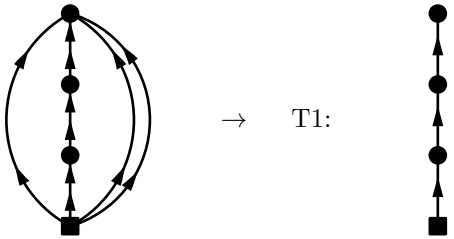


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{76}$$

$$a_1 = \epsilon^{k_3k_4k_5}_{k_1}$$
$$a_2 = \epsilon^{k_6}_{k_3k_4k_5}$$
$$a_3 = \epsilon_{k_2k_6}$$

Diagram 37:

$$\begin{aligned}\text{PO4.37} &= \lim_{\tau\to\infty}\frac{(-1)^3}{(3!)}\sum_{k_i} O^{40}_{k_1k_2k_3k_4}\Omega^{11}_{k_5k_1}\Omega^{11}_{k_6k_5}\Omega^{04}_{k_6k_2k_3k_4}\int_0^\tau \mathrm{d}\tau_1\mathrm{d}\tau_2\mathrm{d}\tau_3\theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2)e^{-\tau_1\epsilon^{k_5}_{k_1}}e^{-\tau_2\epsilon^{k_6}_{k_5}}e^{-\tau_3\epsilon_{k_2k_3k_4k_6}}\\ &= \frac{(-1)^3}{(3!)}\sum_{k_i}\frac{O^{40}_{k_1k_2k_3k_4}\Omega^{11}_{k_5k_1}\Omega^{11}_{k_6k_5}\Omega^{04}_{k_6k_2k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_5k_2k_3k_4}\ \epsilon_{k_2k_3k_4k_6}}\end{aligned} \tag{77}$$

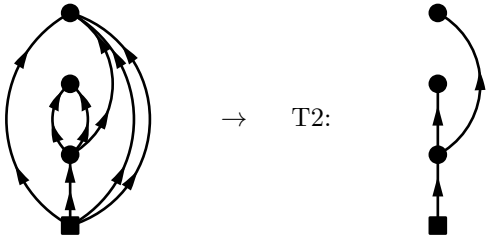


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{78}$$

$$\begin{aligned} a_1 &= \epsilon^{k_5}_{k_1} \\ a_2 &= \epsilon^{k_6}_{k_5} \\ a_3 &= \epsilon_{k_2k_3k_4k_6} \end{aligned}$$

Diagram 38:

$$\begin{aligned} \text{PO4.38} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{02}_{k_5k_6} \Omega^{04}_{k_7k_2k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1) e^{-\tau_1 \epsilon^{k_5k_6k_7}_{k_1}} e^{-\tau_2 \epsilon_{k_5k_6}} e^{-\tau_3 \epsilon_{k_2k_3k_4k_7}} \\ &= \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{02}_{k_5k_6} \Omega^{04}_{k_7k_2k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_5k_6}\ \epsilon_{k_2k_3k_4k_7}} \end{aligned} \tag{79}$$

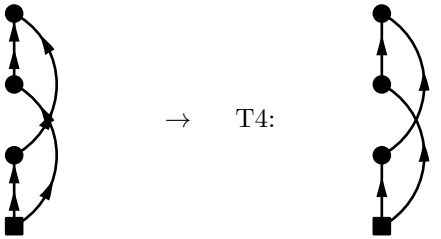


$$\text{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{80}$$

$$a_1 = \epsilon_{k_1}^{k_5 k_6 k_7}$$
$$a_2 = \epsilon_{k_5 k_6}$$
$$a_3 = \epsilon_{k_2 k_3 k_4 k_7}$$

Diagram 39:

$$\text{PO4.39} = \lim_{\tau\to\infty} \frac{-(-1)^3}{2} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{11}_{k_4 k_2} \Omega^{02}_{k_4 k_3} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon_{k_1}^{k_3}} e^{-\tau_2 \epsilon_{k_2}^{k_4}} e^{-\tau_3 \epsilon_{k_3 k_4}}$$
$$= \frac{-(-1)^3}{2} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{11}_{k_4 k_2} \Omega^{02}_{k_4 k_3} \left[\frac{1}{\epsilon_{k_1 k_4}\ \epsilon_{k_1 k_2}\ \epsilon_{k_3 k_4}} + \frac{1}{\epsilon_{k_1 k_2}\ \epsilon_{k_2 k_3}\ \epsilon_{k_3 k_4}} \right] \tag{81}$$



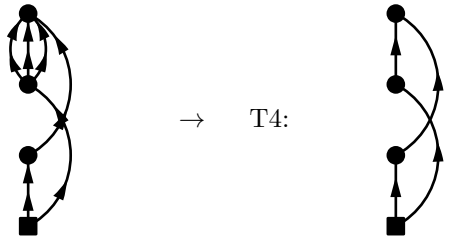
$\rightarrow$ T4:

$$\text{T4} = \frac{1}{(a_1 + a_3)(a_2 + a_1 + a_3)a_3} + \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{82}$$

$$a_1 = \epsilon_{k_1}^{k_3}$$
$$a_2 = \epsilon_{k_2}^{k_4}$$
$$a_3 = \epsilon_{k_3 k_4}$$

Diagram 40:

$$\text{PO4.40} = \lim_{\tau\to\infty} \frac{-(-1)^3}{(3!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{31}_{k_4 k_5 k_6 k_2} \Omega^{04}_{k_4 k_5 k_6 k_3} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon_{k_1}^{k_3}} e^{-\tau_2 \epsilon_{k_2}^{k_4 k_5 k_6}} e^{-\tau_3 \epsilon_{k_3 k_4 k_5 k_6}}$$
$$= \frac{-(-1)^3}{(3!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{31}_{k_4 k_5 k_6 k_2} \Omega^{04}_{k_4 k_5 k_6 k_3} \left[\frac{1}{\epsilon_{k_1 k_4 k_5 k_6}\ \epsilon_{k_1 k_2}\ \epsilon_{k_3 k_4 k_5 k_6}} + \frac{1}{\epsilon_{k_1 k_2}\ \epsilon_{k_2 k_3}\ \epsilon_{k_3 k_4 k_5 k_6}} \right] \tag{83}$$



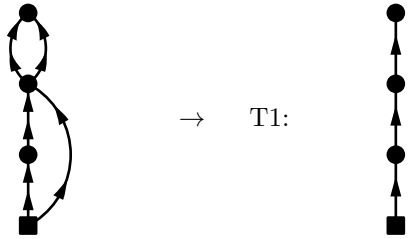
$\rightarrow$ T4:

$$\mathrm{T4} = \frac{1}{(a_1+a_3)(a_2+a_1+a_3)a_3} + \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{84}$$

$$\begin{aligned} a_1 &= \epsilon_{k_1}^{k_3} \\ a_2 &= \epsilon_{k_2}^{k_4 k_5 k_6} \\ a_3 &= \epsilon_{k_3 k_4 k_5 k_6} \end{aligned}$$

Diagram 41:

$$\begin{aligned} \mathrm{PO4.41} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{22}_{k_4 k_5 k_3 k_2} \Omega^{02}_{k_4 k_5} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3}_{k_1}} e^{-\tau_2 \epsilon^{k_4 k_5}_{k_2 k_3}} e^{-\tau_3 \epsilon_{k_4 k_5}} \\ &= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{11}_{k_3 k_1} \Omega^{22}_{k_4 k_5 k_3 k_2} \Omega^{02}_{k_4 k_5}}{\epsilon_{k_1 k_2}\ \epsilon_{k_2 k_3}\ \epsilon_{k_4 k_5}} \end{aligned} \tag{85}$$



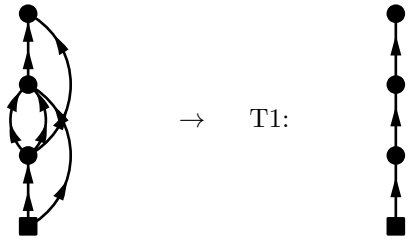
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{86}$$

$$a_1 = \epsilon^{k_3}_{k_1}$$
$$a_2 = \epsilon^{k_4 k_5}_{k_2 k_3}$$
$$a_3 = \epsilon_{k_4 k_5}$$

Diagram 42:

$$\text{PO4.42} = \lim_{\tau\to\infty} \frac{-(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{13}_{k_6 k_3 k_4 k_2} \Omega^{02}_{k_6 k_5} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_3 k_4 k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6}_{k_2 k_3 k_4}} e^{-\tau_3 \epsilon_{k_5 k_6}}$$
$$= \frac{-(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{31}_{k_3 k_4 k_5 k_1} \Omega^{13}_{k_6 k_3 k_4 k_2} \Omega^{02}_{k_6 k_5}}{\epsilon_{k_1 k_2}\ \epsilon_{k_2 k_3 k_4 k_5}\ \epsilon_{k_5 k_6}} \tag{87}$$



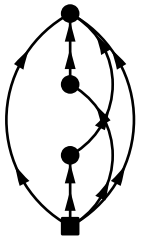
$\rightarrow$ T1:

$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{88}$$

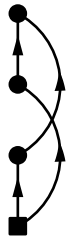
$$a_1 = \epsilon^{k_3 k_4 k_5}_{k_1}$$
$$a_2 = \epsilon^{k_6}_{k_2 k_3 k_4}$$
$$a_3 = \epsilon_{k_5 k_6}$$

Diagram 43:

$$\text{PO4.43} = \lim_{\tau\to\infty} \frac{-(-1)^3}{2(2!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{11}_{k_6 k_2} \Omega^{04}_{k_6 k_5 k_3 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6}_{k_2}} e^{-\tau_3 \epsilon_{k_3 k_4 k_5 k_6}}$$
$$= \frac{-(-1)^3}{2(2!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{11}_{k_6 k_2} \Omega^{04}_{k_6 k_5 k_3 k_4} \left[\frac{1}{\epsilon_{k_1 k_3 k_4 k_6}\ \epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_3 k_4 k_5 k_6}} + \frac{1}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_2 k_3 k_4 k_5}\ \epsilon_{k_3 k_4 k_5 k_6}} \right] \tag{89}$$



$\rightarrow$ T4:

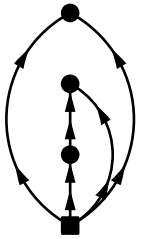


$$\mathrm{T4} = \frac{1}{(a_1+a_3)(a_2+a_1+a_3)a_3} + \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{90}$$

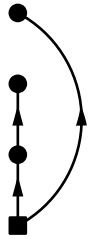
$$\begin{aligned} a_1 &= \epsilon_{k_1}^{k_5} \\ a_2 &= \epsilon_{k_2}^{k_6} \\ a_3 &= \epsilon_{k_3k_4k_5k_6} \end{aligned}$$

Diagram 44:

$$\begin{aligned} \mathrm{PO4.44} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{11}_{k_5k_1} \Omega^{02}_{k_5k_2} \Omega^{02}_{k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1) e^{-\tau_1 \epsilon^{k_5}_{k_1}} e^{-\tau_2 \epsilon_{k_2k_5}} e^{-\tau_3 \epsilon_{k_3k_4}} \\ &= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{11}_{k_5k_1} \Omega^{02}_{k_5k_2} \Omega^{02}_{k_3k_4}}{\epsilon_{k_1k_2}\ \epsilon_{k_2k_5}\ \epsilon_{k_3k_4}} \end{aligned} \tag{91}$$



$\rightarrow$ T3:

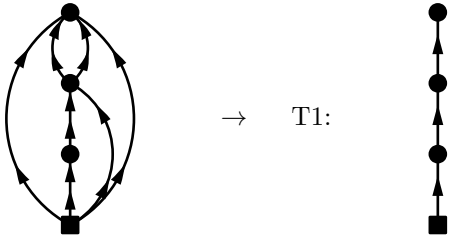


$$\mathrm{T3} = \frac{1}{(a_1+a_2)a_2a_3} \tag{92}$$

$$a_1 = \epsilon^{k_5}_{k_1}$$
$$a_2 = \epsilon_{k_2 k_5}$$
$$a_3 = \epsilon_{k_3 k_4}$$

Diagram 45:

$$\begin{aligned}\text{PO4.45} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{11}_{k_5k_1} \Omega^{22}_{k_6k_7k_5k_2} \Omega^{04}_{k_6k_7k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6k_7}_{k_2k_5}} e^{-\tau_3 \epsilon_{k_3k_4k_6k_7}} \\ &= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{11}_{k_5k_1} \Omega^{22}_{k_6k_7k_5k_2} \Omega^{04}_{k_6k_7k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_2k_5k_3k_4}\ \epsilon_{k_3k_4k_6k_7}}\end{aligned} \tag{93}$$

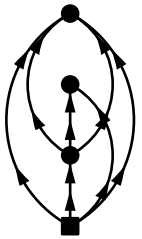


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{94}$$

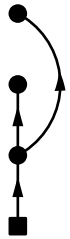
$$a_1 = \epsilon^{k_5}_{k_1}$$
$$a_2 = \epsilon^{k_6k_7}_{k_2k_5}$$
$$a_3 = \epsilon_{k_3k_4k_6k_7}$$

Diagram 46:

$$\begin{aligned}\text{PO4.46} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{02}_{k_5k_2} \Omega^{04}_{k_6k_7k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1) e^{-\tau_1 \epsilon^{k_5k_6k_7}_{k_1}} e^{-\tau_2 \epsilon_{k_2k_5}} e^{-\tau_3 \epsilon_{k_3k_4k_6k_7}} \\ &= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{02}_{k_5k_2} \Omega^{04}_{k_6k_7k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_2k_5}\ \epsilon_{k_3k_4k_6k_7}}\end{aligned} \tag{95}$$



$\rightarrow$ T2:

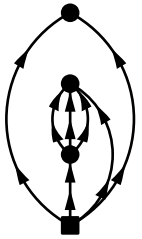


$$\mathrm{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{96}$$

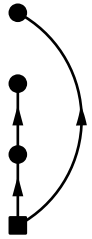
$$\begin{aligned} a_1 &= \epsilon_{k_1}^{k_5k_6k_7} \\ a_2 &= \epsilon_{k_2k_5} \\ a_3 &= \epsilon_{k_3k_4k_6k_7} \end{aligned}$$

Diagram 47:

$$\begin{aligned} \mathrm{PO4.47} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{04}_{k_5k_6k_7k_2} \Omega^{02}_{k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1) e^{-\tau_1 \epsilon_{k_1}^{k_5k_6k_7}} e^{-\tau_2 \epsilon_{k_2k_5k_6k_7}} e^{-\tau_3 \epsilon_{k_3k_4}} \\ &= \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{31}_{k_5k_6k_7k_1} \Omega^{04}_{k_5k_6k_7k_2} \Omega^{02}_{k_3k_4}}{\epsilon_{k_1k_2}\ \epsilon_{k_2k_5k_6k_7}\ \epsilon_{k_3k_4}} \end{aligned} \tag{97}$$



$\rightarrow$ T3:

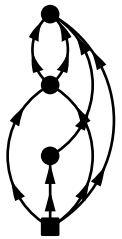


$$\mathrm{T3} = \frac{1}{(a_1+a_2)a_2a_3} \tag{98}$$

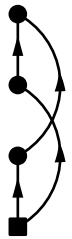
$$a_1 = \epsilon^{k_5 k_6 k_7}_{k_1}$$
$$a_2 = \epsilon_{k_2 k_5 k_6 k_7}$$
$$a_3 = \epsilon_{k_3 k_4}$$

Diagram 48:

$$\text{PO4.48} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{22}_{k_6 k_7 k_2 k_3} \Omega^{04}_{k_6 k_7 k_5 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6 k_7}_{k_2 k_3}} e^{-\tau_3 \epsilon_{k_4 k_5 k_6 k_7}}$$
$$= \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{22}_{k_6 k_7 k_2 k_3} \Omega^{04}_{k_6 k_7 k_5 k_4} \left[\frac{1}{\epsilon_{k_1 k_4 k_6 k_7}\ \epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_4 k_5 k_6 k_7}} + \frac{1}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_2 k_3 k_4 k_5}\ \epsilon_{k_4 k_5 k_6 k_7}} \right] \tag{99}$$



$\rightarrow$ T4:

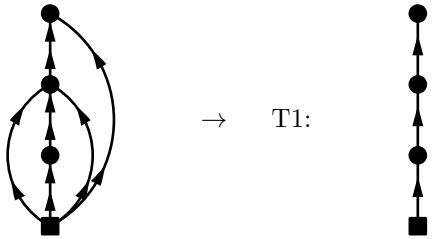


$$\text{T4} = \frac{1}{(a_1 + a_3)(a_2 + a_1 + a_3)a_3} + \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{100}$$

$$a_1 = \epsilon^{k_5}_{k_1}$$
$$a_2 = \epsilon^{k_6 k_7}_{k_2 k_3}$$
$$a_3 = \epsilon_{k_4 k_5 k_6 k_7}$$

Diagram 49:

$$\text{PO4.49} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{13}_{k_6 k_5 k_2 k_3} \Omega^{02}_{k_6 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6}_{k_2 k_3 k_5}} e^{-\tau_3 \epsilon_{k_4 k_6}}$$
$$= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{11}_{k_5 k_1} \Omega^{13}_{k_6 k_5 k_2 k_3} \Omega^{02}_{k_6 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_2 k_3 k_5 k_4}\ \epsilon_{k_4 k_6}} \tag{101}$$



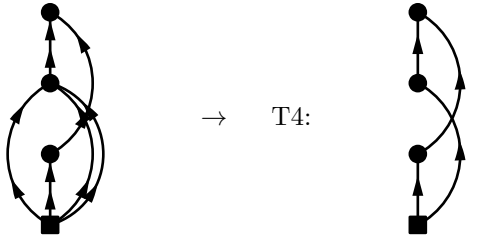
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{102}$$

$$\begin{aligned} a_1 &= \epsilon^{k_5}_{k_1} \\ a_2 &= \epsilon^{k_6}_{k_2k_3k_5} \\ a_3 &= \epsilon_{k_4k_6} \end{aligned}$$

Diagram 50:

$$\begin{aligned} \mathrm{PO4.50} &= \lim_{\tau\to\infty} \frac{-(-1)^3}{(3!)} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{11}_{k_5k_1} \Omega^{13}_{k_6k_2k_3k_4} \Omega^{02}_{k_6k_5} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1}} e^{-\tau_2 \epsilon^{k_6}_{k_2k_3k_4}} e^{-\tau_3 \epsilon_{k_5k_6}} \\ &= \frac{-(-1)^3}{(3!)} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{11}_{k_5k_1} \Omega^{13}_{k_6k_2k_3k_4} \Omega^{02}_{k_6k_5} \left[\frac{1}{\epsilon_{k_1k_6}\ \epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_5k_6}} + \frac{1}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_2k_3k_4k_5}\ \epsilon_{k_5k_6}} \right] \end{aligned} \tag{103}$$



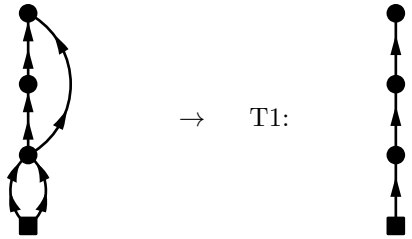
$\rightarrow$ T4:

$$\mathrm{T4} = \frac{1}{(a_1+a_3)(a_2+a_1+a_3)a_3} + \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{104}$$

$$a_1 = \epsilon^{k_5}_{k_1}$$
$$a_2 = \epsilon^{k_6}_{k_2 k_3 k_4}$$
$$a_3 = \epsilon_{k_5 k_6}$$

Diagram 51:

$$\text{PO4.51} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{22}_{k_3 k_4 k_1 k_2} \Omega^{11}_{k_5 k_3} \Omega^{02}_{k_5 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}_{k_1 k_2}} e^{-\tau_2 \epsilon^{k_5}_{k_3}} e^{-\tau_3 \epsilon_{k_4 k_5}}$$
$$= \frac{(-1)^3}{(2!)} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{22}_{k_3 k_4 k_1 k_2} \Omega^{11}_{k_5 k_3} \Omega^{02}_{k_5 k_4}}{\epsilon_{k_1 k_2}\ \epsilon_{k_3 k_4}\ \epsilon_{k_4 k_5}} \tag{105}$$



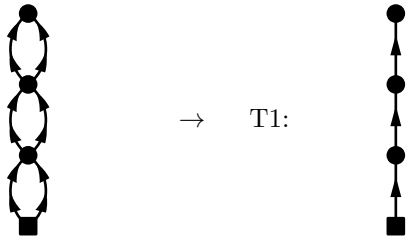
$\rightarrow$ T1:

$$\text{T1} = \frac{1}{(a_1 + a_2 + a_3)(a_2 + a_3)a_3} \tag{106}$$

$$a_1 = \epsilon^{k_3 k_4}_{k_1 k_2}$$
$$a_2 = \epsilon^{k_5}_{k_3}$$
$$a_3 = \epsilon_{k_4 k_5}$$

Diagram 52:

$$\text{PO4.52} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^3} \sum_{k_i} O^{20}_{k_1 k_2} \Omega^{22}_{k_3 k_4 k_1 k_2} \Omega^{22}_{k_5 k_6 k_3 k_4} \Omega^{02}_{k_5 k_6} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1)\theta(\tau_3 - \tau_2) e^{-\tau_1 \epsilon^{k_3 k_4}_{k_1 k_2}} e^{-\tau_2 \epsilon^{k_5 k_6}_{k_3 k_4}} e^{-\tau_3 \epsilon_{k_5 k_6}}$$
$$= \frac{(-1)^3}{(2!)^3} \sum_{k_i} \frac{O^{20}_{k_1 k_2} \Omega^{22}_{k_3 k_4 k_1 k_2} \Omega^{22}_{k_5 k_6 k_3 k_4} \Omega^{02}_{k_5 k_6}}{\epsilon_{k_1 k_2}\ \epsilon_{k_3 k_4}\ \epsilon_{k_5 k_6}} \tag{107}$$



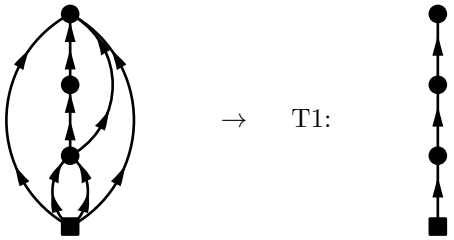
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{108}$$

$$\begin{aligned} a_1 &= \epsilon^{k_3k_4}_{k_1k_2} \\ a_2 &= \epsilon^{k_5k_6}_{k_3k_4} \\ a_3 &= \epsilon_{k_5k_6} \end{aligned}$$

Diagram 53:

$$\begin{aligned} \mathrm{PO4.53} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{22}_{k_5k_6k_1k_2} \Omega^{11}_{k_7k_5} \Omega^{04}_{k_7k_6k_3k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5k_6}_{k_1k_2}} e^{-\tau_2 \epsilon^{k_7}_{k_5}} e^{-\tau_3 \epsilon_{k_3k_4k_6k_7}} \\ &= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{22}_{k_5k_6k_1k_2} \Omega^{11}_{k_7k_5} \Omega^{04}_{k_7k_6k_3k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_5k_3k_4k_6}\ \epsilon_{k_3k_4k_6k_7}} \end{aligned} \tag{109}$$



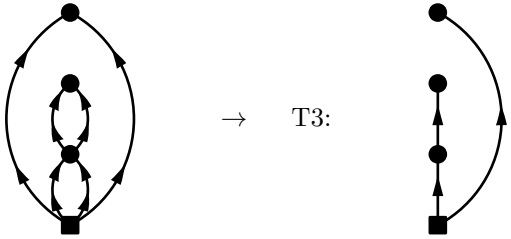
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{110}$$

$$a_1 = \epsilon^{k_5 k_6}_{k_1 k_2}$$
$$a_2 = \epsilon^{k_7}_{k_5}$$
$$a_3 = \epsilon_{k_3 k_4 k_6 k_7}$$

Diagram 54:

$$\text{PO4.54} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^3} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{02}_{k_5 k_6} \Omega^{02}_{k_3 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1) e^{-\tau_1 \epsilon^{k_5 k_6}_{k_1 k_2}} e^{-\tau_2 \epsilon_{k_5 k_6}} e^{-\tau_3 \epsilon_{k_3 k_4}}$$
$$= \frac{(-1)^3}{(2!)^3} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{02}_{k_5 k_6} \Omega^{02}_{k_3 k_4}}{\epsilon_{k_1 k_2}\ \epsilon_{k_5 k_6}\ \epsilon_{k_3 k_4}} \tag{111}$$

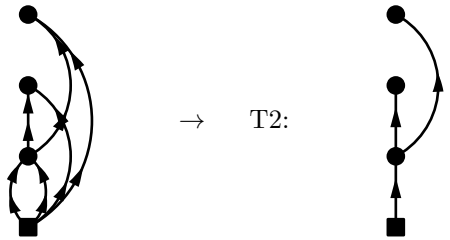


$$\text{T3} = \frac{1}{(a_1 + a_2) a_2 a_3} \tag{112}$$

$$a_1 = \epsilon^{k_5 k_6}_{k_1 k_2}$$
$$a_2 = \epsilon_{k_5 k_6}$$
$$a_3 = \epsilon_{k_3 k_4}$$

Diagram 55:

$$\text{PO4.55} = \lim_{\tau\to\infty} \frac{-(-1)^3}{2(2!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{02}_{k_5 k_3} \Omega^{02}_{k_6 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2 - \tau_1) \theta(\tau_3 - \tau_1) e^{-\tau_1 \epsilon^{k_5 k_6}_{k_1 k_2}} e^{-\tau_2 \epsilon_{k_3 k_5}} e^{-\tau_3 \epsilon_{k_4 k_6}}$$
$$= \frac{-(-1)^3}{2(2!)} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{02}_{k_5 k_3} \Omega^{02}_{k_6 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_3 k_5}\ \epsilon_{k_4 k_6}} \tag{113}$$

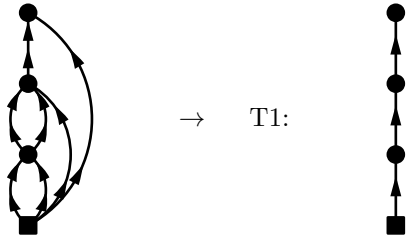


$$\text{T2} = \frac{1}{(a_1+a_2+a_3)a_2a_3} \tag{114}$$

$$\begin{aligned} a_1 &= \epsilon^{k_5k_6}_{k_1k_2} \\ a_2 &= \epsilon_{k_3k_5} \\ a_3 &= \epsilon_{k_4k_6} \end{aligned}$$

Diagram 56:

$$\begin{aligned} \text{PO4.56} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{22}_{k_5k_6k_1k_2} \Omega^{13}_{k_7k_5k_6k_3} \Omega^{02}_{k_7k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5k_6}_{k_1k_2}} e^{-\tau_2 \epsilon^{k_7}_{k_3k_5k_6}} e^{-\tau_3 \epsilon_{k_4k_7}} \\ &= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{22}_{k_5k_6k_1k_2} \Omega^{13}_{k_7k_5k_6k_3} \Omega^{02}_{k_7k_4}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_3k_5k_6k_4}\ \epsilon_{k_4k_7}} \end{aligned} \tag{115}$$

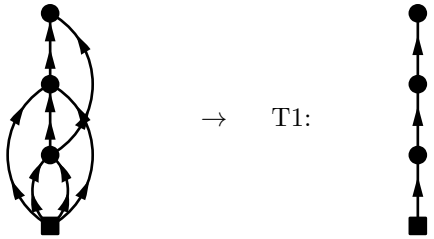


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{116}$$

$$a_1 = \epsilon^{k_5 k_6}_{k_1 k_2}$$
$$a_2 = \epsilon^{k_7}_{k_3 k_5 k_6}$$
$$a_3 = \epsilon_{k_4 k_7}$$

Diagram 57:

$$\text{PO4.57} = \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)^2} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{13}_{k_7 k_5 k_3 k_4} \Omega^{02}_{k_7 k_6} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5 k_6}_{k_1 k_2}} e^{-\tau_2 \epsilon^{k_7}_{k_3 k_4 k_5}} e^{-\tau_3 \epsilon_{k_6 k_7}}$$
$$= \frac{(-1)^3}{(2!)^2} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{22}_{k_5 k_6 k_1 k_2} \Omega^{13}_{k_7 k_5 k_3 k_4} \Omega^{02}_{k_7 k_6}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_3 k_4 k_5 k_6}\ \epsilon_{k_6 k_7}} \tag{117}$$

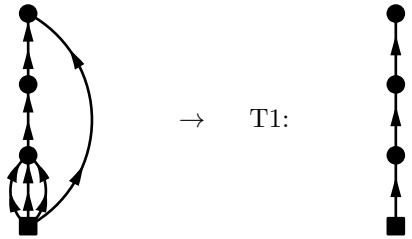


$$\text{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{118}$$

$$a_1 = \epsilon^{k_5 k_6}_{k_1 k_2}$$
$$a_2 = \epsilon^{k_7}_{k_3 k_4 k_5}$$
$$a_3 = \epsilon_{k_6 k_7}$$

Diagram 58:

$$\text{PO4.58} = \lim_{\tau\to\infty} \frac{(-1)^3}{(3!)} \sum_{k_i} O^{40}_{k_1 k_2 k_3 k_4} \Omega^{13}_{k_5 k_1 k_2 k_3} \Omega^{11}_{k_6 k_5} \Omega^{02}_{k_6 k_4} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1 k_2 k_3}} e^{-\tau_2 \epsilon^{k_6}_{k_5}} e^{-\tau_3 \epsilon_{k_4 k_6}}$$
$$= \frac{(-1)^3}{(3!)} \sum_{k_i} \frac{O^{40}_{k_1 k_2 k_3 k_4} \Omega^{13}_{k_5 k_1 k_2 k_3} \Omega^{11}_{k_6 k_5} \Omega^{02}_{k_6 k_4}}{\epsilon_{k_1 k_2 k_3 k_4}\ \epsilon_{k_5 k_4}\ \epsilon_{k_4 k_6}} \tag{119}$$



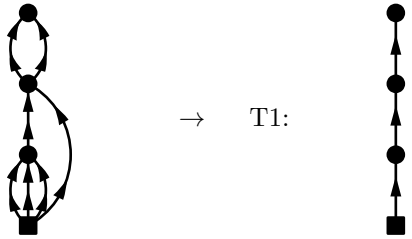
$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{120}$$

$$\begin{aligned} a_1 &= \epsilon^{k_5}_{k_1k_2k_3} \\ a_2 &= \epsilon^{k_6}_{k_5} \\ a_3 &= \epsilon_{k_4k_6} \end{aligned}$$

Diagram 59:

$$\begin{aligned} \mathrm{PO4.59} &= \lim_{\tau\to\infty} \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} O^{40}_{k_1k_2k_3k_4} \Omega^{13}_{k_5k_1k_2k_3} \Omega^{22}_{k_6k_7k_5k_4} \Omega^{02}_{k_6k_7} \int_0^\tau \mathrm{d}\tau_1 \mathrm{d}\tau_2 \mathrm{d}\tau_3 \theta(\tau_2-\tau_1)\theta(\tau_3-\tau_2) e^{-\tau_1 \epsilon^{k_5}_{k_1k_2k_3}} e^{-\tau_2 \epsilon^{k_6k_7}_{k_4k_5}} e^{-\tau_3 \epsilon_{k_6k_7}} \\ &= \frac{(-1)^3}{(2!)(3!)} \sum_{k_i} \frac{O^{40}_{k_1k_2k_3k_4} \Omega^{13}_{k_5k_1k_2k_3} \Omega^{22}_{k_6k_7k_5k_4} \Omega^{02}_{k_6k_7}}{\epsilon_{k_1k_2k_3k_4}\ \epsilon_{k_4k_5}\ \epsilon_{k_6k_7}} \end{aligned} \tag{121}$$



$\rightarrow$ T1:

$$\mathrm{T1} = \frac{1}{(a_1+a_2+a_3)(a_2+a_3)a_3} \tag{122}$$

$$a_1 = \epsilon^{k_5}_{k_1 k_2 k_3}$$
$$a_2 = \epsilon^{k_6 k_7}_{k_4 k_5}$$
$$a_3 = \epsilon_{k_6 k_7}$$