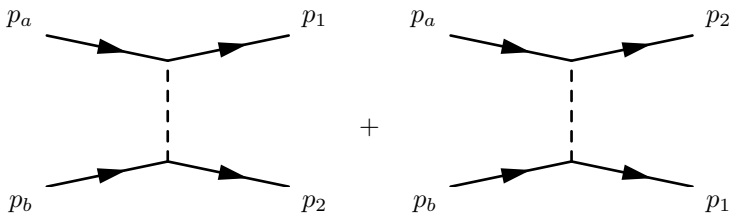
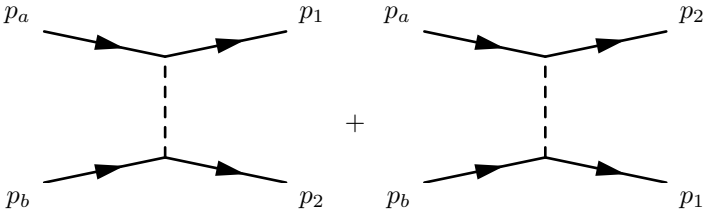

p_a
p_1
p_b
p_2
+
p_a
p_2
p_b
p_1

$$
\begin{aligned}
<f|\,S-1\,|i> &= \frac{(-ig)^2}{2(2\pi)^6}\int\frac{d^4k}{(2\pi)^4}\frac{i}{k^2-m^2+i\epsilon}\int d^4x_1 d^4x_2\left\{e^{i(p_1+k-p_a)x_1}e^{i(p_2-k-p_b)}\right. \\
&\quad +e^{i(p_2+k-p_a)x_1}e^{i(p_1-k-p_b)}+e^{i(p_1+k-p_b)x_1}e^{i(p_2-k-p_1)} \\
&\quad \left.+e^{i(p_2+k-p_b)x_1}e^{i(p_1-k-p_a)}\right\} \\
&= \frac{i(-ig)^2}{(2\pi)^6}\int\frac{(2\pi)^4 d^4k}{k^2-m^2+i\epsilon}\left\{\delta^4(p_1+k-p_a)\delta^4(p_2-k-p_b)\right. \\
&\qquad\qquad \left.+\delta^4(p_2+k-p_a)\delta^4(p_1-k-p_b)\right\} \\
&= \frac{i(-ig)^2}{(2\pi)^6}\left\{\frac{1}{(p_1-p_a)^2-m^2}+\frac{1}{(p_2-p_a)^2-m^2}\right\} \\
&\quad \times(2\pi)^4\delta^4(p_1+p_2-p_a-p_b)
\end{aligned}
$$

$=$



(1)