

$$\begin{aligned}
 J(p, k) &= \frac{1}{2\epsilon} + \int [\mathrm{D}k'] f(p, k, k') \\
 &= \frac{1}{2\epsilon} \left[2 - \left(\frac{p^2}{k^2} \right)^\epsilon - \left(\frac{p^2}{(p-k)^2} \right)^\epsilon \right].
 \end{aligned}$$