

$$f(p, k, k')|_{k \ll k' \sim p} \longrightarrow 0 + \frac{p^2}{(p - k')^2 k'^2} - \frac{p^2}{k'^2 (p - k')^2} = 0,$$

$$f(p, k, k')|_{k \sim k' \ll p} \longrightarrow \frac{k^2}{k'^2 (k - k')^2} + \frac{1}{(k - k')^2} - \frac{1}{k'^2} = \frac{2(k \cdot k')}{k'^2 (k - k')^2}.$$