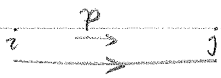
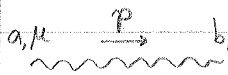
Feynman Rules of Renormalized QCD

original Lagrangian | counterterm Lagrangian

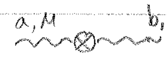


$$= \frac{i(\not{p} + m_f)\,\delta_{ij}}{p^2 - m^2 + i\epsilon}$$

$$= i(\not{p}\,\delta_{\psi_f} - \delta_{m_f})$$



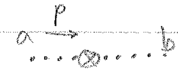
$$= \frac{-i\delta^{ab}}{p^2 + i\epsilon}\left(g^{\mu\nu} - (1-\xi)\frac{p^\mu p^\nu}{p^2 + i\epsilon}\right)$$



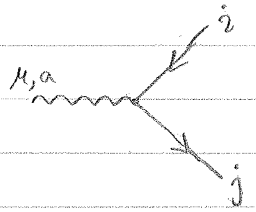
$$= -i\left(g^{\mu\nu}p^2 - p^\mu p^\nu\right)\delta^{ab}\delta_{[illegible]} + i\,p^\mu p^\nu \delta_\xi$$

(combinatoric factor = 1/2)

$$= \frac{i\delta^{ab}}{p^2 + i\epsilon}$$



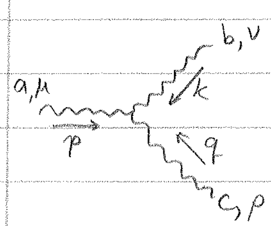
$$= i\delta^{ab}p^2\,\delta_\eta$$



$$= -ig\mu^{2\epsilon}\gamma_\mu T^a_{ij}$$

($g \to \delta_{A\psi\psi_f}$ for the counterterm vertex)

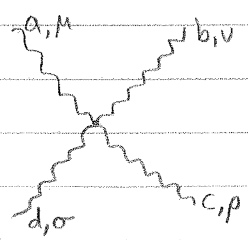
combinatoric factor = 1



$$= -g\mu^\epsilon f^{abc}\left(g_{\mu\nu}(p-k)_\rho + g_{\nu\rho}(k-q)_\mu + g_{\rho\nu}(q-p)_\nu\right)$$

($g \to \delta_{A^3}$ for the counterterm vertex)

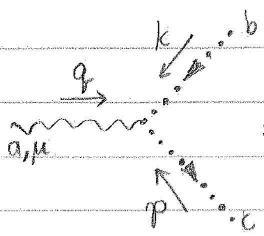
combinatoric factor $= \frac{1}{3!}$



$$= -ig^2\mu^{2\epsilon}\left[f^{abe}f^{ecd}(g_{\mu\rho}g_{\nu\sigma} - g_{\mu\sigma}g_{\nu\rho}) + f^{ace}f^{ebd}(g_{\mu\nu}g_{\rho\sigma} - g_{\mu\sigma}g_{\nu\rho}) + f^{ade}f^{ebc}(g_{\mu\nu}g_{\rho\sigma} - g_{\mu\rho}g_{\nu\sigma})\right]$$

($g^2 \to \delta_{A^4}$ for the counterterm vertex)

combinatoric factor $= \frac{1}{4!}$



$$= -g\mu^\epsilon f^{abc}\,p_\mu$$

($g \to \delta_{\eta\eta A}$ for the counterterm vertex)

combinatoric factor = 1