8.701

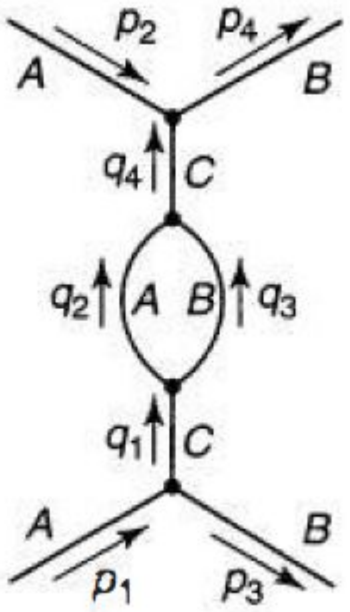
Introduction to Nuclear and Particle Physics

Markus Klute - MIT

3. Feynman Calculus

3.5 Divergency

Two loop diagram



$$\mathcal{M} = i\left(\frac{g}{2\pi}\right)^4 \frac{1}{[(p_1 - p_3)^2 - m_C^2c^2]^2} \int \frac{1}{[(p_1 - p_3 - q)^2 - m_A^2c^2](q^2 - m_B^2c^2)}\, d^4q$$

Divergency and Cutoff

$$\int^{\infty} \frac{1}{q^4} q^3 \, dq = \ln q|^{\infty} = \infty$$

$$\frac{-M^2c^2}{(q^2 - M^2c^2)}$$

Running couplings “constants” and “invariant” masses

$$m_{\text{physical}} = m + \delta m; \quad g_{\text{physical}} = g + \delta g$$