Midterm 1 Fun Facts

Speed of Light: c = 1

Planks constant: $\frac{h}{2\pi} = 1$

$r_{\text{nucleus}} \sim 10^{-15}$ meters.

The mass of the electron is $\sim 10^{-3}$ GeV

The mass of the muon is $\sim 10^{-1}$ GeV

The mass of the tauon is ~ 1 GeV

The mass of the W-boson $\sim$ mass Z-boson ~ 100 GeV

1 TeV = 1000 GeV

$\alpha = 10^{-2}$ $\alpha_W \equiv 0.5\alpha$ $\alpha_G \equiv G_N m_p^2 = 10^{-39}$

GeV^{-1}=10^{-15}m GeV = 10^{-27}kg $\text{GeV}^{-1} = 6 \cdot 10^{-25}$ s

$\epsilon_L = \frac{1}{\sqrt{2}}\left(0, 1, -i, 0\right)$ and $\epsilon_R = \frac{1}{\sqrt{2}}\left(0, 1, +i, 0\right)$

Cross section: $\sigma \sim \frac{1}{E_1 E_2}|M|^2 d\Pi_{LIPS}$

Decay rate: $\Gamma \sim \frac{1}{E}|M|^2 d\Pi_{LIPS}$

Life-time: $\tau = \frac{1}{\Gamma}$

$d\Pi_{LIPS} = \delta^4(\sum p_i - \sum p_f) \prod_f \cancel{d^3 p_f}$

$\cancel{d^3 p} = \frac{d^3 p}{(2\pi)^3 2E_p}$

$$\eta_{\mu\nu} = \begin{cases} 1 & \mu = \nu = 0 \\ -1 & \mu = \nu = 1, 2, 3\ (i) \\ 0 & \text{otherwise} \end{cases}$$