

Homework #1

Due Jan 26

Read as much of Griffiths chapters 1,2,3 as you like

1. Griffiths 1.2
2. Griffiths 1.10 Use Table IIB. All Physical Review journals are easily accessible online. This article is at

http://prola.aps.org/abstract/RMP/v35/i2/p314_1

3. Griffiths 2.3
4. Griffiths 2.5
5. Griffiths 2.7
6. Griffiths 3.18
7. Griffiths 3.22 (just parts a) and d))
8. Using the same back-of-the-envelope kind of calculation that we used in class to calculate the cross-section for the process

$$e^+e^- \rightarrow \mu^+\mu^-$$

calculate the ratio R

$$R = \frac{\sigma(e^+e^- \rightarrow q\bar{q})}{\sigma(e^+e^- \rightarrow \mu^+\mu^-)}$$

as a function of the Center-of-Mass energy. Here q stands for any flavor of quark. (For this problem you can ignore any resonances that might occur).

9. Calculate the Branching Ratio (\mathcal{B}) for the process

$$\tau^- \rightarrow \mu^- \bar{\nu}_\mu \nu_\tau$$

again using a back-of-the-envelope calculation. Compare your result against the current *world average* in the Particle Data Book.

10. Calculate the Center-of-Mass Energy \sqrt{s} for a proton-proton collision, for the case where a) a proton with energy E collides with another proton at rest, and b) the two protons collide head-on, each with energy E .