

Homework Assignment #4 due Friday April 3

/6/ Start with the general cross section formula. Consider the special case of elastic scattering, $a + b \rightarrow a + b$, **in the center of mass frame of reference**:

$$a(p_1) + b(p_2) \rightarrow a(p_3) + b(p_4)$$

with $\mathbf{p}_1 + \mathbf{p}_2 = 0$ and $\mathbf{p}_3 + \mathbf{p}_4 = 0$.

/A/ Prove that $|\mathbf{p}_1| = |\mathbf{p}_2| = |\mathbf{p}_3| = |\mathbf{p}_4|$.

/B/ /Prove that $d\sigma / d\Omega_3 = |M|^2 / (64 \pi^2 s)$.

/7/ Use again the pion-nucleon interaction with a pseudo-scalar coupling (*cf.* the lecture of Monday March 23). Calculate the cross section for the process

$$\text{proton} + \text{antiproton} \rightarrow \pi^+ + \pi^-.$$

i.e., proton-antiproton annihilation to $\pi^+ + \pi^-$.

The Feynman diagram is ...

