Physics 492 homework IX, due Fri Mar 15

Reading: Chapter 9

Problems:

1. Williams, Problem 9.1.

2. Williams, Problem 9.2. Hint: Here "free particle" means "real particle" for which

$$E^2 - \vec{p}^2\, c^2 = m^2\, c^4\,.$$

The photon mass is 0, of course.

3. Williams, Problem 9.3.

4. Williams, Problem 9.4.

5. Consider the charged pion decays, with their branching ratios in parentheses,

$$\pi^- \longrightarrow \mu^- + \overline{\nu}_\mu \qquad (\simeq 100\%)$$

$$\pi^- \longrightarrow e^- + \overline{\nu}_e \qquad (\simeq 0.01\%)$$

(a) In the π^- rest frame, what are the μ^- and $\overline{\nu}_\mu$ energies?
(b) In the π^- rest frame, what are the e^- and $\overline{\nu}_e$ energies?
(Particle masses: Williams, Tables 10.3 and 12.1)