Assignment V  
Due by Tuesday March 2: #1 and #3

Assignment VI  
Due Wednesday March 10: 2, 4, 5, 6

1. The twins again:  
a. If the accelerated (a = g = 10 m/s²) Ulysses travels for what he says is 6 years (in one direction), how far does he go (as measured in Homer’s frame)? How long does Homer say the trip takes?  
b. If he travels for what Homer says is 10 years, how far does Ulysses travel? What does U’s journey look like when plotted on a Minkowski diagram, using Homer’s x and t? Draw it.  
c. How long would it take Ulysses to get to α-centauri (half the time with a = g and half the time with a=-g) (find both U’s time and Homer’s time)?

Problems 2 - 5 are most easily done by writing conservation of 4-momentum, and squaring the equation, as we did in class for the Compton Effect and for the Center of Momentum Problems. Also recall that u=P/E.

2. Show that it is impossible for an isolated free electron to absorb or emit a photon.

3. A particle of rest mass m₁ and velocity u₁ collides with a stationary particle of rest mass m₂ and is absorbed by it. Find the rest mass M and the velocity v of the resultant compound system.

4. Consider the particle reaction A --> B + C (with particle masses m_A, m_B, m_C. )  
a. If A is at rest in the lab frame, show that in the lab frame, particle B has energy E_B = (m_A^2 + m_B^2 - m_C^2)/2m_A  
b. An atom of Mass m at rest decays to a state of rest energy M-δ by emitting a photon of energy hf. Show that hf<δ.  
c. If A decays while moving in the lab frame, find the relation between the angle at which B comes off, and the energies of  A and B.

5. Griffiths – Redo example 12.8, while NOT assuming that the mass of the neutrino is zero. Then do problem 12.31.

6. Griffiths 12.42