Phys 242 Homework

Problem Set 1

Due Wednesday, August 30

1. Give the physical meaning of each of Maxwell's equations. That is, what is each of Maxwell's equations telling us about E and/or B fields?

2. Thornton and Rex 2.3

3. Thornton and Rex 2.21

4. Thornton and Rex 2.28

5. Consider a train car of proper length L_0 with photodectors at either end and a light source placed in the middle. If we flash the light source, light will arrive simultaneously at both detectors (since it is in the middle) and we can use this fact to synchronize clocks at either end of the train (starting the clocks when photodetectors record light). Call this frame K'.

   Now let the train move with velocity v to the right and consider this arrangement from the ground frame. Call this frame K.

   a. As viewed from frame K, which photodetector sees the light flash first?

   b. As viewed from K, how much time does it take for the light flash to reach the front of the train?

   c. As viewed from K, how much time does it take for the light flash to reach the back of the train?

   d. Show that the time difference between the flashes is given by $\frac{vL_0}{c^2}\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$

   e. As viewed from K' the clocks on the train are in synch. As viewed from K, the clocks are out-of-synch. By how much time are they out-of-synch?