PROBLEM SET #7

Physics 1BH

Winter 2016, Prof. Saltzberg

DUE: Friday, Feb. 26 in my office by 11:30am
READING: Chapter 7

You are encouraged to work with others, but try as much as you can on your own. At a minimum, check your answers with someone else.

1. PM 7.24 [Pulling a frame]. Note that they are assuming you are pulling it at a constant, non-zero, speed. For consistency, let's all assume ℓ is the total perimeter of the rectangle and b is the length of the sides perpendicular to the motion and a be the length of the sides parallel to the motion.

2. PM 7.26 [Sliding Bar]. After part a answer: You have found that the speed is a negative exponential that goes as $exp\left(-\frac{t}{\tau}\right)$. Show that your expression for τ, which depends on mass of the bar, resistance, B-field, and length of the bar has overall units of time, as it must.

3. PM 7.40 [Inductance of a cylindrical solenoid]. Only do the first part, where the field is uniform to the end.

4. PM 7.42 [RL circuit]. Also explicitly calculate the energy dissipated by the resistor during this time and show it is the difference between the energy supplied by the battery and the energy stored in the indctor.

5 PM 7.44 [Magnetic energy in the galaxy]

6. PM 7.46 [Decay time for current in Earth]

7. [Eddy currents] A sheet of copper is placed halfway into a region with a uniform magnetic field. If we attempt to pull it out of the region or push it farther in a resisting force appears. For both cases draw diagrams that explain the origin of this force and its direction.