Name: 1C Discussion- Week 1

1. **Rail problem**. A pair of rails run along the x-direction and are separated by a distance L. They are connected at some point by a stationary wire. To the right of the stationary wire a slide-wire completes the circuit. The slide-wire can move along the rails. A uniform magnetic field $\mathbf{B} = -B\hat{z}$ points into the page. The slide-wire has mass m, resistance R and initial position $x_0 = 0$.
(a) Find the force F on the rail when it is given a velocity $\mathbf{v} = v_0\hat{x}$.
(b) Solve for the motion of the wire as a function of time. What is the behavior of the velocity and position of the wire at large t?
(c) The circuit in the wire dissipates power as $P = \epsilon I$. Where does this energy come from? Calculate the total energy dissipated (as $t \to \infty$). Does this agree with your theory of where the energy came from?