ECE 09.303 Fall 2018
Homework 8
Chapter 8/27 – Electromagnetic Induction

1.

A conducting loop with area 0.15 m^2 and resistance 6.0 Ω lies in the x–y plane. A spatially uniform magnetic field points in the z-direction. The field varies with time according to $B_z = at^2 - b$, where $a = 2.0\ T/s^2$ and $b = 8.0\ T$. Find the loop current (a) at $t = 3.0$ s and (b) when $B_z = 0$.

2.

Figure 27.39 shows a pair of parallel conducting rails a distance l apart in a uniform magnetic field $\vec{B}$. A resistor R is connected across the rails, and a conducting bar of negligible resistance is being pulled along the rails with velocity $\vec{v}$ to the right. (a) What direction is the current in the resistor? (b) At what rate does the agent pulling the bar do work?

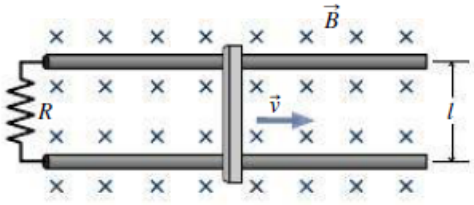

FIGURE 27.39 Problems 46–49 and 75

3.

An electron is inside a solenoid, 28 cm from the axis. It experiences a 1.3-fN electric force. At what rate is the solenoid's magnetic field changing?

4.

A single-turn loop of radius R carries current I. How does the magnetic-energy density at the loop center compare with that of a long solenoid of the same radius, carrying the same current, and consisting of n turns per unit length?