Physics 1214, Homework #6 (due 10/10)

M1 Two solenoids are coaxial and fairly close to each other. While the resistance of the variable resistor connected to the left-hand solenoid is increased at a constant rate, the induced current through the resistor $R$ will

A. flow from $a$ to $b$.
B. flow from $b$ to $a$.
C. be zero because the rate is constant.

![Solenoids Diagram]

M2 A metal loop moves at constant velocity toward a long wire carrying a steady current $I$, as shown below. The current induced in the loop is directed

A. clockwise.
B. counterclockwise.
C. zero.

![Metal Loop Diagram]
Problems

P1 Two concentric loops of radii 10 cm and 20 cm are in a uniform magnetic field which is increasing at a constant rate of 0.1 T/s. The loops are connected through a resistor $R = 1 \, \Omega$. What is the current through the resistor in cases (a) and (b)?

P2 A slide-wire rod is pulled to the right in a uniform magnetic field of 0.2 T with a speed of 5 m/s, as shown below. What is the current through the rod?

P3 A circular coil of radius 10 cm rotates in magnetic field 0.05 T. The maximum emf produced is 2 mV. What is the angular velocity of the coil?

P4 A uniform magnetic field of 0.1 T is restricted to the region shown below, that is, $B = 0.1 \, \text{T}$ if $5 \, \text{cm} < x < 25 \, \text{cm}$ and $0 \, \text{cm} < y < 20 \, \text{cm}$, and $B = 0$ otherwise. A rectangular loop with a side length of 1 cm moves along the $x$ axis at 10 m/s and crosses the field region. Draw the emf induced in the loop as a function of time $t$. Be sure to mark the moments when the emf changes. What is the maximum induced emf?