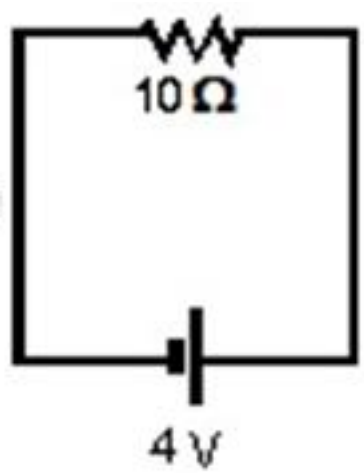
Question: The circuit shown is in a uniform magnetic field that is into the page. The circuit is square with sides of length L. The counter-clockwise current in the circuit is 0.20 A. At what rate is the magnitude of the magnetic field changing? Is it increasing or decreasing?



Question: Consider the four Maxwell equations:

I. $\oint \vec{E} \cdot d\vec{A} = q/\varepsilon_0$

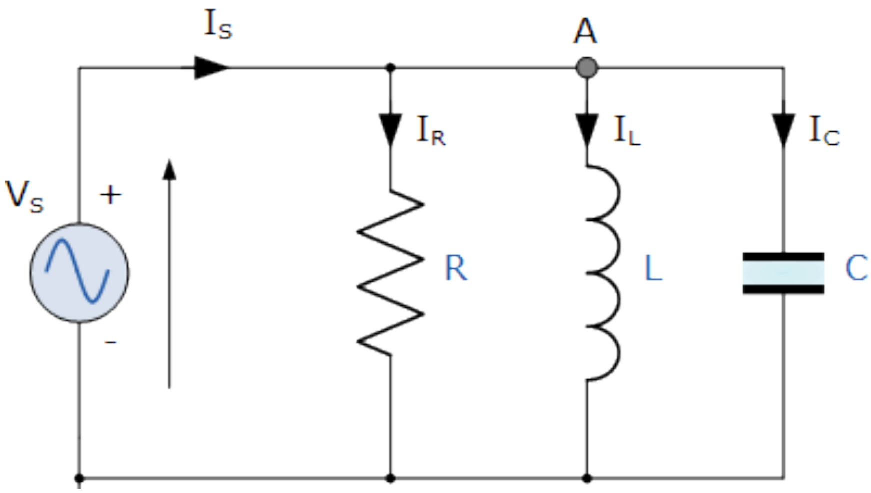
II. $\oint \vec{B} \cdot d\vec{A} = 0$

III. $\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_B}{dt}$

IV. $\oint \vec{B} \cdot d\vec{s} = \mu_0 i + \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$

Which of these equations must be modified if magnetic monopoles are discovered? What would each of the extra terms involve?

Question: Consider the **parallel** RLC circuit below.



A (2 points). If the drive voltage $V_s = \xi_m \sin(\omega t)$, write down the voltage across the resistor, the inductor, and the capacitor as a function of time.

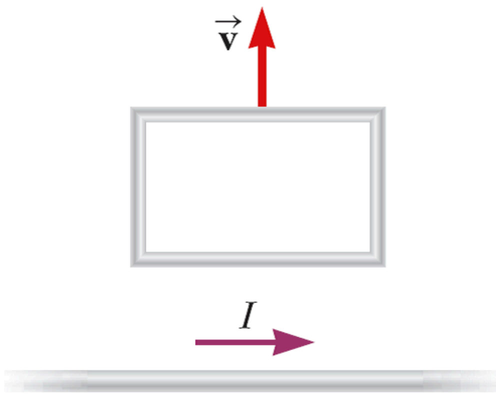
B (3 points). Derive the current I_R through the resistor.

C (3 points). Derive the time-dependent current I_L through the inductor, and write in terms of the inductive reactance $X_L = \omega L$.

D (3 points). Derive the time-dependent current I_C through the capacitor, and write in terms of the capacitive reactance $X_C = 1/(\omega C)$.

E (3 points). Write down (do not solve) the expression relating the time-dependent currents I_R, I_L, and I_C to the total current through the circuit $I_S = I_m \sin(\omega t - \varphi)$.

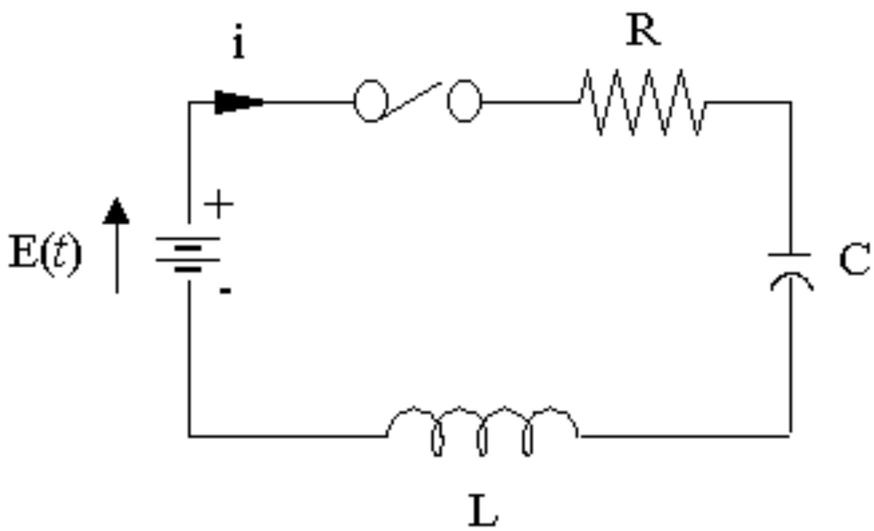
Question: If you pull a loop of wire away from a current-carrying wire, as shown below:



A. What direction is the induced current around the loop?

B. Is there a force between the long wire and the loop? If so, what direction does it point?

Question: Imagine an RLC circuit driven by a DC EMF rather than an AC EMF, as shown below.



A. Immediately after the switch is closed, what is the voltage across the resistor, the capacitor, and the inductor?

B. A long time after the switch is closed, what is the voltage across the resistor, the capacitor, and the inductor?