

# PH 223 Week 10

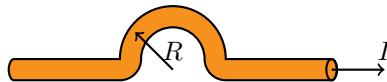
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Winter 2024

The last two problems are borrowed/adapted from Chapters 29 and 30 of the *Student Workbook for Physics for Scientists and Engineers*. The first problem is from the Week 9 Help and Practice Problems for PH 213, and probably was originally sourced from the same textbook.

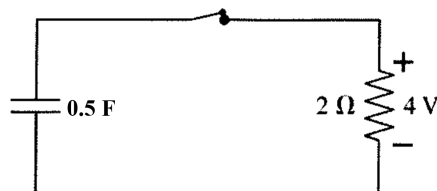
## Activity 1

Use the Biot-Savart law to find the magnetic field strength at the center of the semicircle in the figure below.



## Activity 2

The capacitor in this circuit was initially charged, then the switch was closed. At this instant of time, the potential difference across the resistor is  $\Delta V_R = 4 \text{ V}$ .



- (a) At this instant of time, what is the current through the resistor?
- (b) What is the current through the resistor over time?
- (c) What is the charge in the capacitor over time?
- (d) If the capacitor consists of two parallel plates of area  $A$ , symbolically calculate the electric flux between them, and the time derivative of this flux.

## Activity 3

The capacitor in an  $LC$  circuit has maximum charge at  $t = 1 \text{ } \mu\text{s}$ . The current through the inductor next reaches a maximum at  $t = 3 \text{ } \mu\text{s}$ .

- (a) When will the inductor current reach a maximum in the opposite direction?
- (b) What is the circuit's period of oscillation?