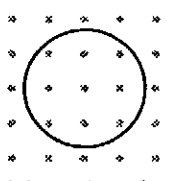
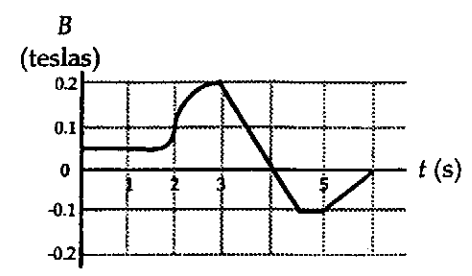


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A circular brass ring, of radius $s = 0.10$ m and resistance $R_0 = 2.0 \Omega$, sits in a uniform magnetic field pointing out of the page. The following graph shows the strength of that field as a function of time. A negative value indicates that the field points into the page, instead of out of the page.



- (a) At what time (or times) is the largest current induced in the ring?
- (b) Between $t = 2$ s and $t = 3$ s, is the induced current clockwise or counterclockwise? Explain your reasoning.
- (c) (Very hard) Between $t = 2$ s and $t = 3$ s, is the induced current increasing or decreasing in magnitude? Explain.
- (d) What is the induced current at time $t = 4.7$ s?
- (e) What is the induced current at time $t = 4$ s?
- (f) Between $t = 5$ s and $t = 6$ s, is the induced current increasing, decreasing, or constant in magnitude? Explain.

a) $I_{ind} \propto \mathcal{E}_{ind}$, $|\mathcal{E}_{ind}| \propto \left| \frac{d\Phi_B}{dt} \right| = \frac{dB \cdot A}{dt}$ since A is constant
 \propto slope of B vs t

Slope is largest around t = 2 s

b) Between $t = 2$ and $t = 3$ s, \vec{B} is increasing out of the page. I_{ind} tries to decrease it, so creates a field pointing in. This means I_{ind} is CW, by RHR

c) Between $t = 2$ s and $t = 3$ s, slope is decreasing, so I_{ind} is decreasing as well.

d) At $t = 4.7$ s, B is not changing $\Rightarrow I_{ind} = 0$

e) At $t = 4$ s, $|I_{ind}| = \left| \frac{\mathcal{E}_{ind}}{R} \right|$

$$|\mathcal{E}_{ind}| = A \frac{dB}{dt} = A \left(\frac{0 - (-0.1)}{0.5 \text{ s}} \right) T$$

②

$$I_{\text{ind}} = \frac{\mathcal{E}_{\text{ind}}}{R} = \frac{(\pi S^2)}{R} (0.2 \text{ T/s})$$

$$= \frac{\pi (0.1)^2}{2} (0.2)$$

$$\underline{\underline{I_{\text{ind}} = 3.14 \times 10^{-3} \text{ A}}}$$

f) Between $t=5$ and $t=6$ s,
slope is constant

$$\Rightarrow \boxed{I_{\text{ind}} = \text{constant}}$$