

Ch 13 Prob. 27

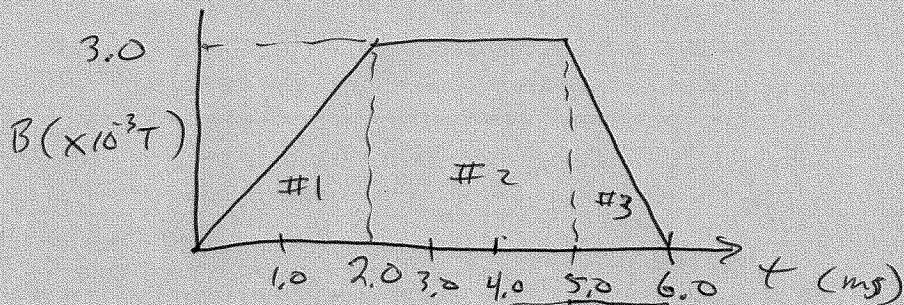
$$r = 10.0 \text{ cm}$$

Plot the magnitude of the induced emf

Area of the loop is

$$A = \pi r^2 = \pi (0.10 \text{ m})^2$$

$$A = 0.0314 \text{ m}^2$$



Region #1

The slope of the plot is

$$\frac{\Delta B}{\Delta t} = \frac{(3 \times 10^{-3} \text{ T} - 0)}{(2 \times 10^{-3} \text{ s} - 0)} = 1.5 \frac{\text{T}}{\text{s}}$$

$$\therefore \mathcal{E}_1 = -A \frac{dB}{dt} = -(0.0314 \text{ m}^2) \left(1.5 \frac{\text{T}}{\text{s}} \right)$$

$$\boxed{\mathcal{E}_1 = -0.047 \text{ V}} = -47 \text{ mV}$$

Region #2

The slope is zero

$$\therefore \boxed{\mathcal{E}_2 = 0 \text{ V}}$$

Region #3

The slope of the plot is

$$\frac{\Delta B}{\Delta t} = \frac{(0 - 3 \times 10^{-3} \text{ T})}{(6.0 \times 10^{-3} \text{ s} - 5.0 \times 10^{-3} \text{ s})} = -3.0 \frac{\text{T}}{\text{s}}$$

$$\therefore \mathcal{E}_3 = -A \frac{dB}{dt} = -(0.0314 \text{ m}^2) \left(-3.0 \frac{\text{T}}{\text{s}} \right)$$

$$\boxed{\mathcal{E}_3 = 0.094 \text{ V}} = 94 \text{ mV}$$

