Prob31-43: Looking down electromagnet with $R_0 = 0.08$m The field decreases linearly from 1.5T to 0.7T in 25 ms. What is the EMF induced around the path drawn in fig that consist of quarter arcs at radial distances $\dfrac{R_0}{4}$ and $\dfrac{R_0}{2}$?

<u>Ans:</u> Flux through the chosen area if we take (clockwise as positive).

$$\phi_m = \vec{B}\cdot\vec{A} = -B\cdot A \ = -B\frac{1}{4}\left[\pi\left(\frac{R}{2}\right)^2 - \pi\left(\frac{R}{4}\right)^2\right] = -B\pi R^2\left(\frac{3}{64}\right)$$

Therefore the induced EMF is: $E = -\dfrac{d\phi_n}{dt} = +\dfrac{3}{64}\pi R^2\left(\dfrac{dB}{dt}\right) - \dfrac{0.8T}{25\times10^{-3}s}$

$\qquad = -\ 30$ mV (counterclockwise)