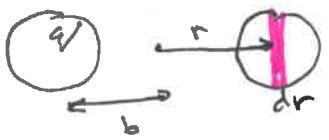
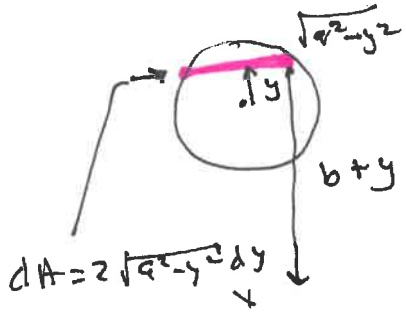
341 Class 33 ch 11 : 10 & old exam #3

10 :



$$B = \frac{\mu_0 N I}{2\pi r}$$

$$= \frac{\mu_0 N I}{2\pi (b+y)}$$



$$\Phi = \frac{\mu_0 N I}{2\pi} \int_{-a}^{a} \frac{2\sqrt{a^2-y^2}}{b+y}\, dy$$

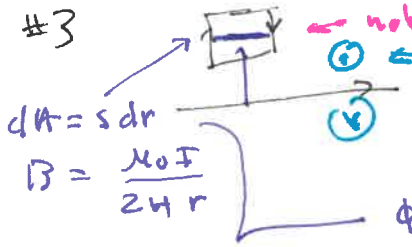
Mathematica (done in video)

$$\pi\left(b-\sqrt{b^2-a^2}\right)$$

$$= \mu_0 N \left(b-\sqrt{b^2-a^2}\right) I$$

flux thru 1 turn: over N turns $L = \frac{\mu_0 N^2}{\left(b-\sqrt{b^2-a^2}\right)}$

old exam #3



note: $\hat{n}$ into page $\Rightarrow \Phi < 0$, $M < 0$

B out

$\hat{n}$ in, $\vec{B}$ out

$$\Phi = -\frac{\mu_0 I s}{2\pi} \int_d^{d+s} \frac{dr}{r} = -\frac{\mu_0 I s}{2\pi} \ln\left(\frac{d+s}{d}\right)$$

$$M = -\frac{\mu_0 s}{2\pi} \ln\left(\frac{d+s}{d}\right)$$

$$\mathcal{E} = -M \frac{dI}{dt} > 0$$

negative; $\frac{dI}{dt}$ positive