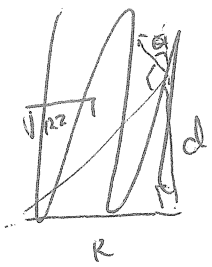
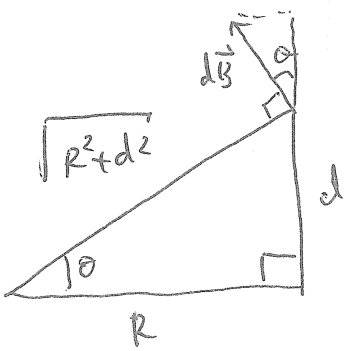
b

#1



$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{d\vec{s} \times \hat{r}}{r^2}$$

$$r = \sqrt{R^2+d^2}$$



SIN ONLY $\frac{R}{\sqrt{R^2+d^2}}$

$$dB_{UP} = \frac{\mu_0 I}{4\pi} \frac{R}{(R^2+d^2)^{3/2}}$$

TOTAL

$$B_{TOTAL} = 2\pi R \left(dB_{UP}\right)$$

$$\boxed{B_{TOTAL} = 2\pi R \frac{\mu_0 I}{2} \frac{R^2}{(R^2+d^2)^{3/2}}}$$

#2

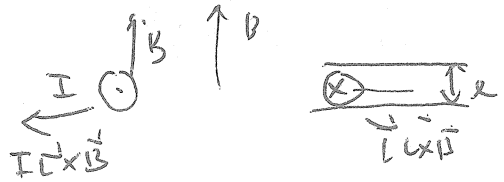
a) $B = \mu_0 n I$!

b) $\Phi = \mu_0 n I \pi R^2$ ea

$$N\frac{d\Phi}{dt} = L\frac{dI}{dt} = \underbrace{\mu_0 n \pi R^2}_{L}\frac{dI}{dt}\, n\ell$$

$$\boxed{L = \mu_0 n^2 \pi R^2 \ell}$$

c)



$I\vec{\ell}\times\vec{B}$

$B = \mu_0 n I$

$\ell I \times B$

FORCE ON A SOLENOID SEGMENT ℓ LONG

$2\pi R\, \mu_0 n I \ell n = 2\pi R \mu_0 n^2 I \ell$

AREA $2\pi R \ell$

d) EXPLODE

$$\frac{F}{\text{AREA}} = \text{PRESSURE} = \frac{2\pi R \mu_0 n^2 I \ell}{2\pi R \ell}$$

$$= \boxed{\mu_0 n^2 I}$$

#3 (WITH CURRENT I)

FLUX DUE TO THE INFINITE WIRE ON LOOP

Φ_m

$$B = \frac{\mu_0 I}{2\pi r} \qquad \Phi = \frac{\mu_0 I a}{2\pi} \int_a^{2a} \frac{1}{r}\, dr$$

$$= \frac{\mu_0 I a}{2\pi} \ln 2$$

$$\boxed{M = \frac{\mu_0 a}{2\pi} \ln 2}$$

$$\text{so} \quad \mathcal{E} = -M \frac{dI}{dt}$$

$$\boxed{\mathcal{E} = -\frac{\mu_0 a}{2\pi} \ln 2 \frac{dI}{dt}}$$

#4

a) ~~$+L\frac{dI}{dt}$~~

$$\boxed{V - L\frac{dI}{dt} - IR = 0}$$

b) $$\boxed{I = 0}$$

c) $$\boxed{I = \frac{V}{R}}$$

d) VOLTAGE WOULD BE INFINITE SINCE $\frac{dI}{dt} = -\infty$