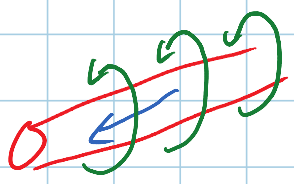
# Solenoids

Wednesday, December 18, 2013
2:20 PM

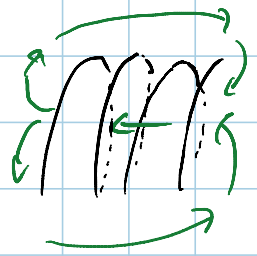
## B field around a wire



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

$$\mu_0 = 4\pi \times 10^{-7} \frac{T \cdot m}{A}$$

## B field around a solenoid



In the middle $B = \frac{\mu_0 I N}{l}$

I = current
N = # of loops/coils/turns
l = length of solenoid

Ex A solenoid of length 0.30m has 200 windings. If B = .025 T what is the current in the solenoid

$$B = \frac{\mu_0 I N}{l}$$

# of turns/unit length

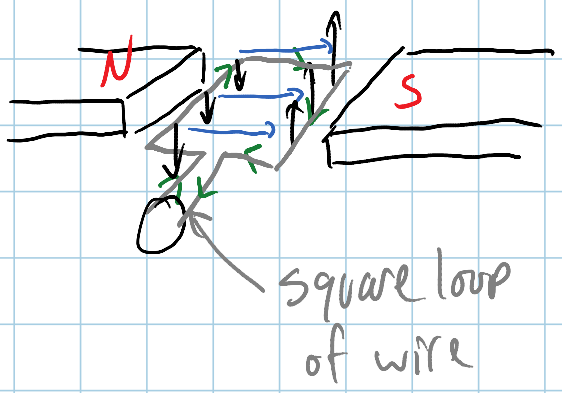
$$B = \mu_0 n I$$

$$.025 = \frac{(4\pi \times 10^{-7})(200) I}{.3m}$$

$$.025 = 8.38 \times 10^{-4} (I)$$

$$I = 29.8A$$

Application:




The magnetic force causes the loop to twist. If the loop is allowed to spin & the current is reversed $\frac{1}{2}$ way thru, the loop could spin continously

(an electric motor)