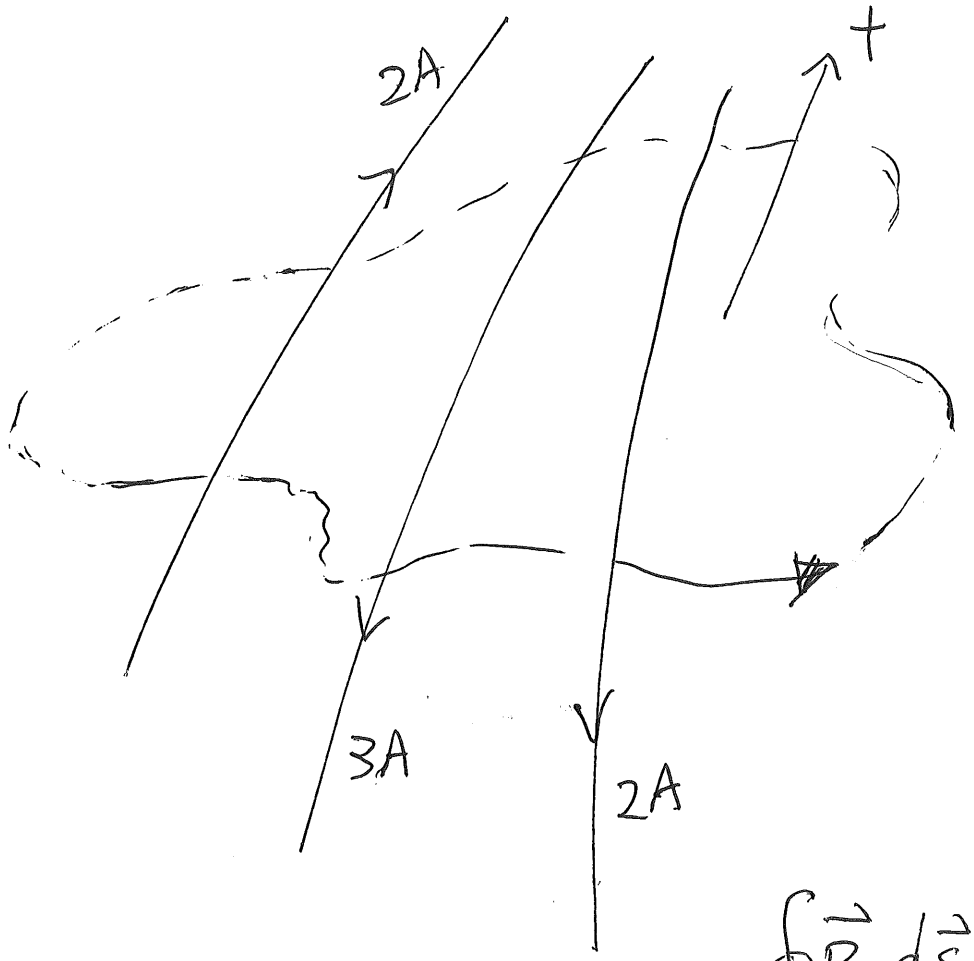
Coulomb's Law to calculate E field ⟷ $\varepsilon_0$ → Gauss's Law to calculate E field for ~~sy~~ ~~simple~~ symmetric system.

Biot-Savart Law to calculate B field ⟷ $\mu_0$ → Ampere's Law to calculate B field for symmetric system.




$$\oint \vec{B} \cdot d\vec{s} = \mu_0 \times$$ (-3)

$$\mu_0 = 4\pi \times 10^{-7}\ T m A^{-1}$$

Using Gauss's Law

$$\varepsilon_0 \oint \vec{E} \cdot d\vec{A} = Q_{en.}$$

$$\Downarrow$$

$$\varepsilon_0 E A = Q_{en}$$

$$\Rightarrow E = \frac{Q_{en}}{\varepsilon_0 A}$$

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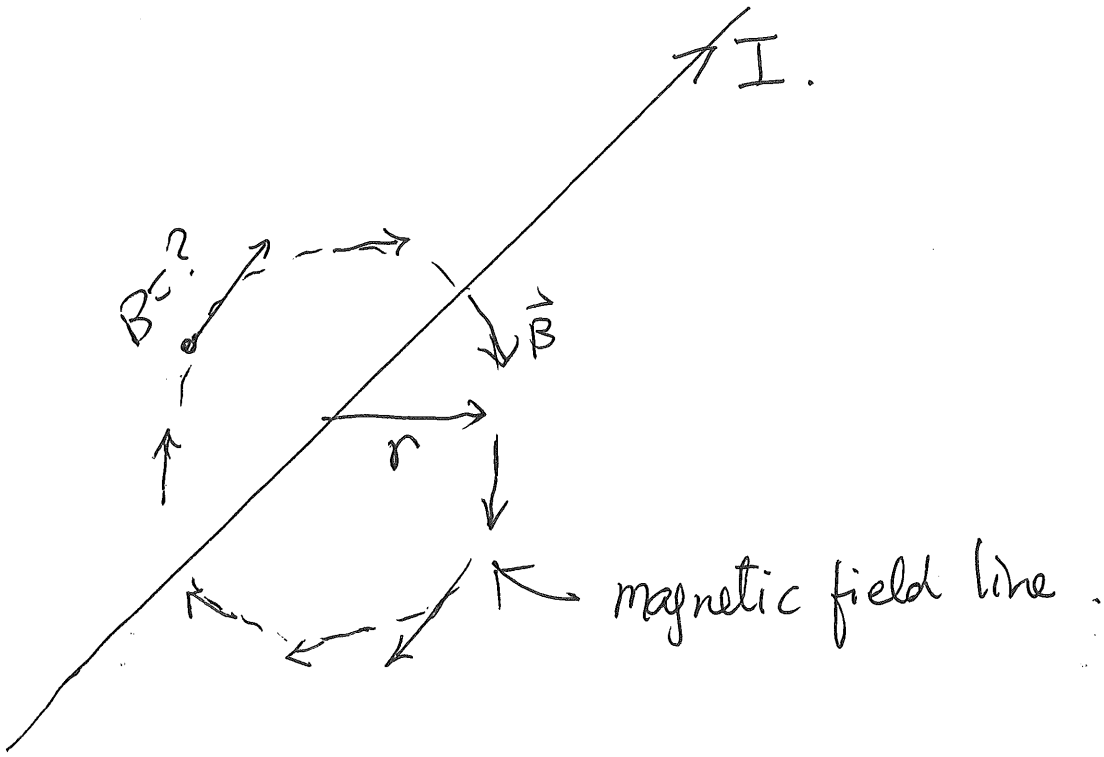
Using Ampere's Law.

$$\oint \vec{B} \cdot d\vec{s} = \mu_0 I_{en.}$$

$$\Rightarrow BL = \mu_0 I_{en}$$

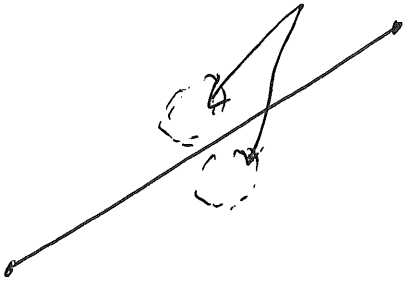
$$\Rightarrow B = \frac{\mu_0 I_{en}}{L.}$$

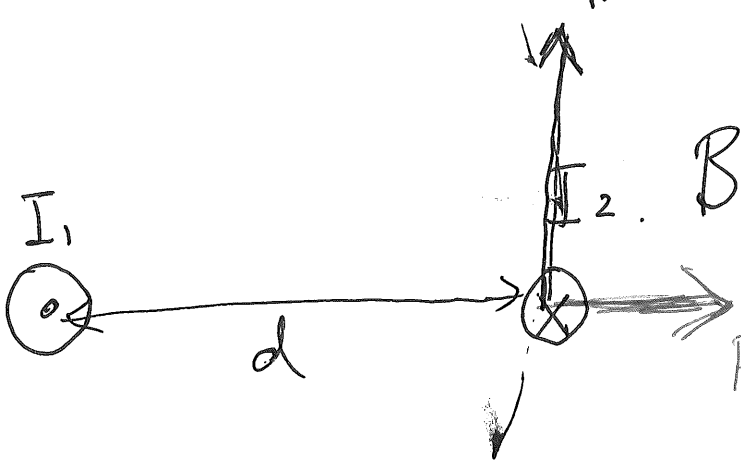



$$B = \frac{\mu_0 I}{2\pi r}$$

Short wire.

region for Ampere's Law to ~~not~~ work.






$B = \frac{\mu_0 I_1}{2\pi d}$.

~~$F = I_2 L B \sin 90°$~~.

$F = I_2 L B \sin 90°$.

$= I_2 L \left(\frac{\mu_0 I_1}{2\pi d}\right)$.

$= \frac{\mu_0 I_1 I_2}{2\pi d} L$.

$\frac{F}{L} = \frac{\mu_0 I_1 I_2}{2\pi d}$ (finite).