# Magnetism Ch 5

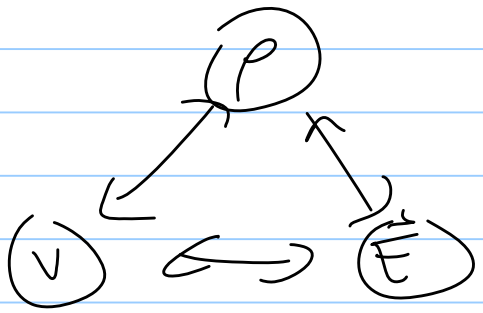
Note Title 3/2/2009

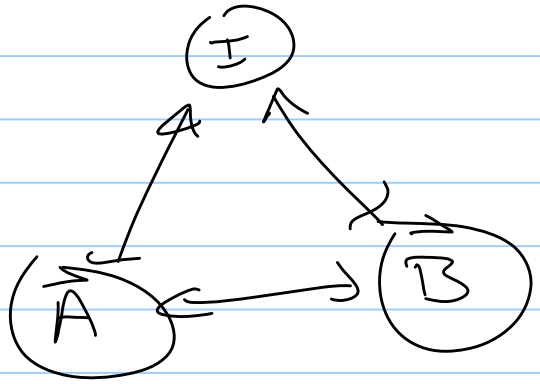
Overview: $\vec{F} = q\vec{E} + q\vec{v}\times\vec{B}$

↑ sheet of charge
vol of charge

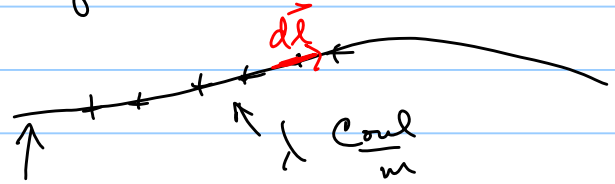
Need to find $\vec{B}$ (given $\vec{B}$ above)

Biot Savart $\vec{B} = \frac{\mu_0}{4\pi}\int \frac{I\, d\vec{\ell}\times\hat{r}}{r^2}$




$\vec{F} = q\vec{v}\times\vec{B}$ ⟶ $d\vec{F} = dq\,\vec{v}\times\vec{B}$




Win: more wire $dq = \lambda\, d\ell$

$d\vec{F} = \lambda\, d\ell\ \vec{v}\times\vec{B} = I\, d\vec{\ell}\times\vec{B}$

$I$

$\vec{I} = \lambda\vec{v}$

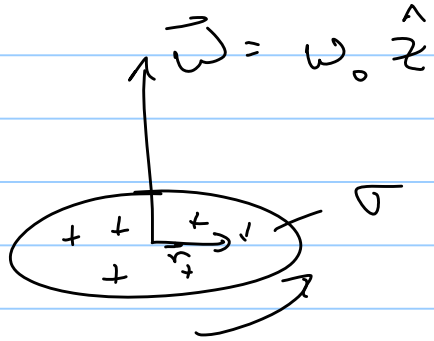
(Paper & put $\sigma$ on it & move it (conveyer belt))

$$dq = \sigma\, da$$

$$d\vec{F} = dq\,\vec{v}\times\vec{B} = \sigma\, da\,\vec{v}\times\vec{B}$$

$$\vec{K} = \sigma\vec{v} \quad \text{surface charge density}$$

$$d\vec{F} = \vec{K}\times\vec{B}\,da$$




Ex: record

Find $\vec{K} = \sigma\vec{v}$

$$\vec{v} = \vec{\omega}\times\vec{r} = \omega r \sin\psi\, \hat{\varphi}$$

($\psi = 90$)

$$\vec{K} = \sigma\omega r\left(-\sin\varphi\,\hat{x} + \cos\varphi\,\hat{y}\right)$$

($\hat{\varphi}$)

$$d\vec{F} = \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ -\sigma\omega r\sin\varphi & \sigma\omega r\cos\varphi & \phi \\ B_{0x} & B_{0y} & \phi \end{vmatrix}$$

$$da = r\,d\varphi\,dr$$