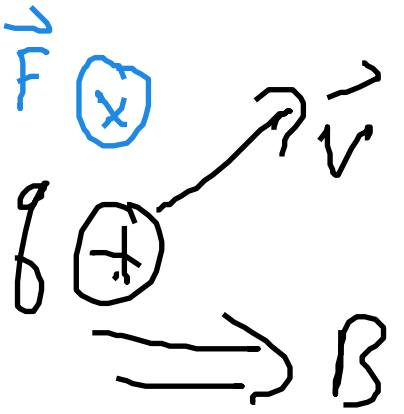
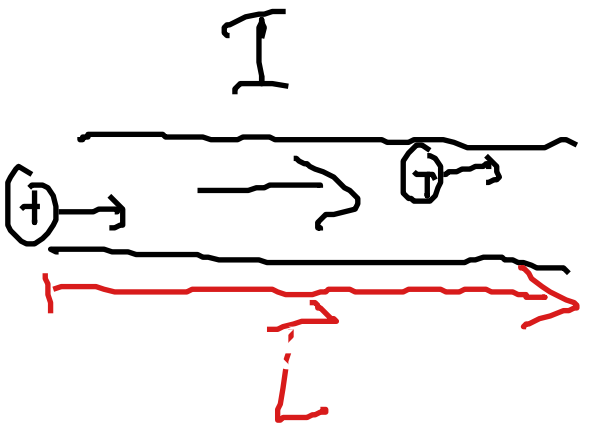
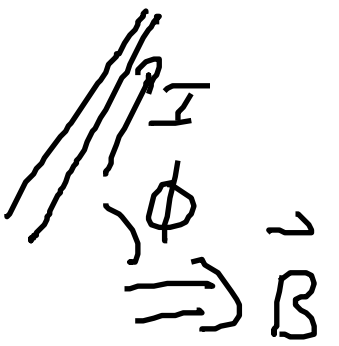
$$\vec{F} = q\vec{v} \times \vec{B}$$





$|\vec{L}|$ = length of wire

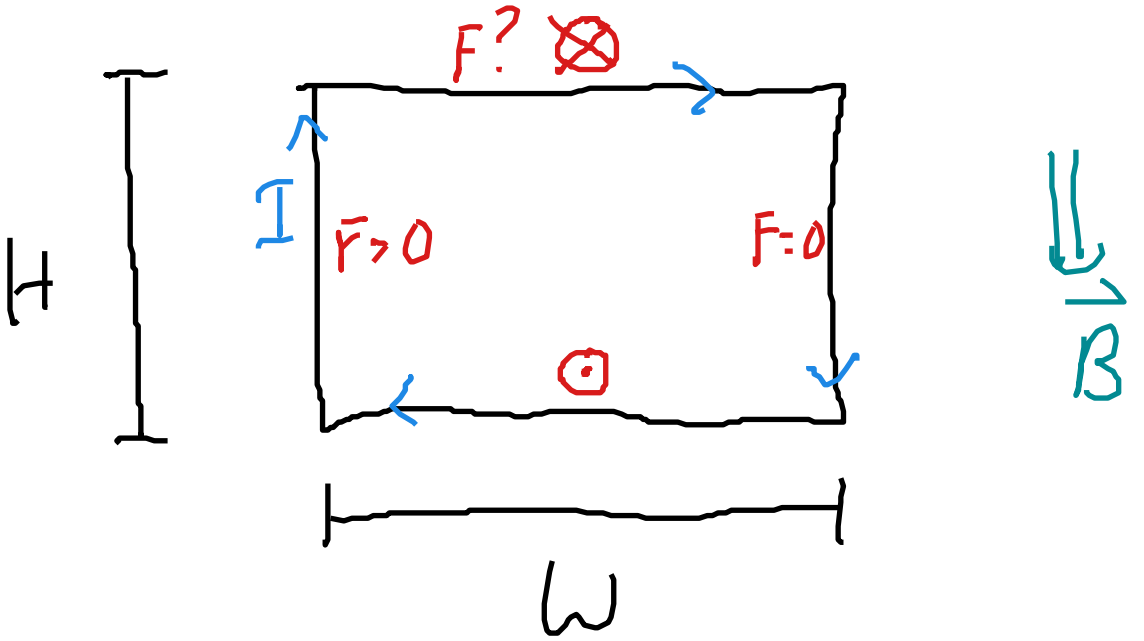
$$\vec{F} = I\vec{L} \times \vec{B}$$



$$|\vec{F}| = ILB\sin\phi$$

could also write $\vec{F} = L\vec{I} \times \vec{B}$ but won't

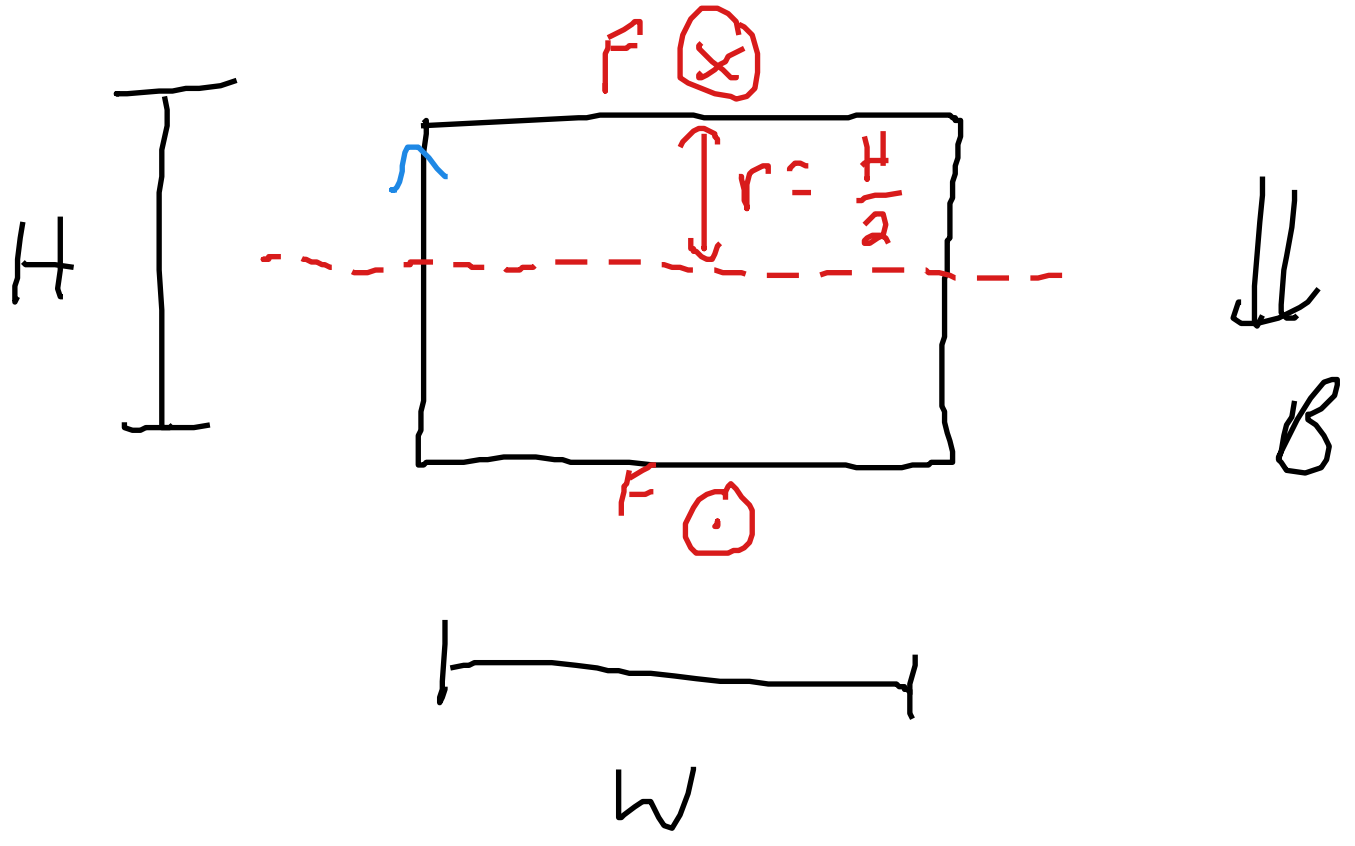
Loop of Wire



$$\vec{F}_{net} = \underbrace{IWB\otimes}_{\text{top}} + \underbrace{IWB\odot}_{\text{bottom}}$$

$$= 0$$

but it will feel a torque

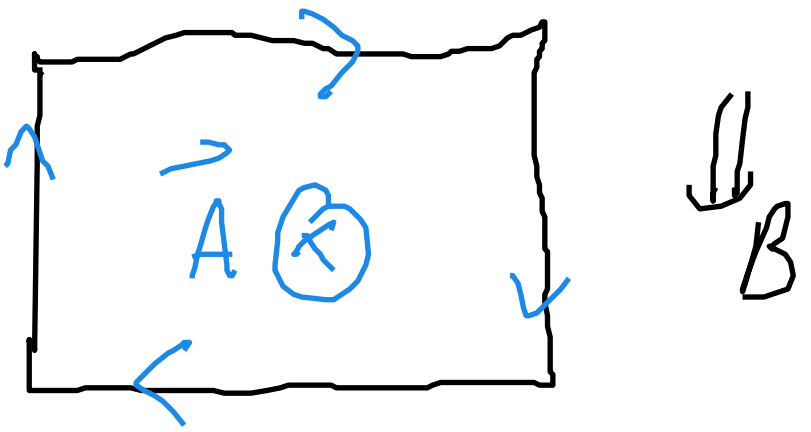


$$\tau = r_\perp F$$

$$\tau = \frac{H}{2} I W B \curvearrowright + \frac{H}{2} I W B \curvearrowright$$

$$\tau = I \underline{H W} B \curvearrowright$$

$$= I A B \curvearrowright$$



Define $\vec{A}$ using a "circle-line RHR"

fingers curl around current

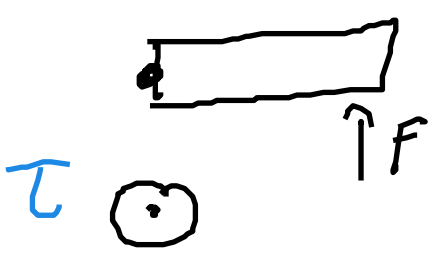
thumb points in direction of $\vec{A}$

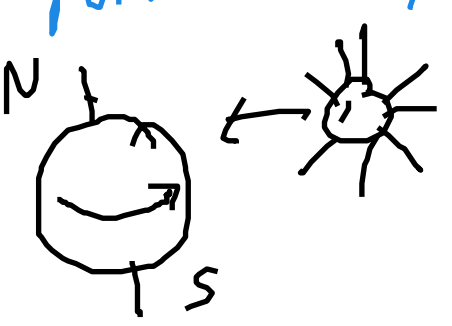
$$\vec{\tau} = I\vec{A} \times \vec{B}$$

thumb: points in direction of $\vec{\tau}$

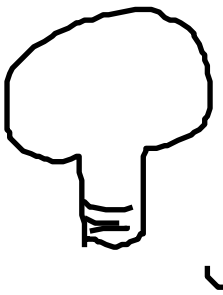
fingers show tendency to spin

τ points along axis



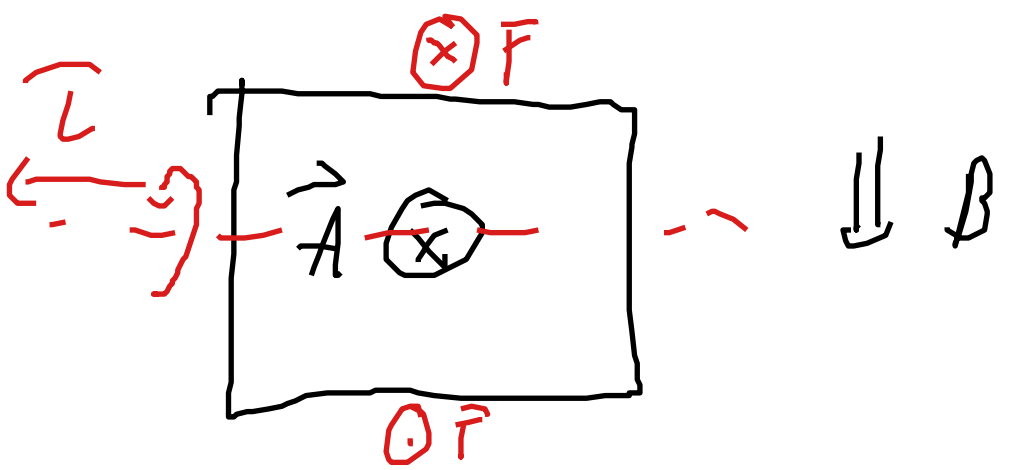


$\vec{\omega}$ = North



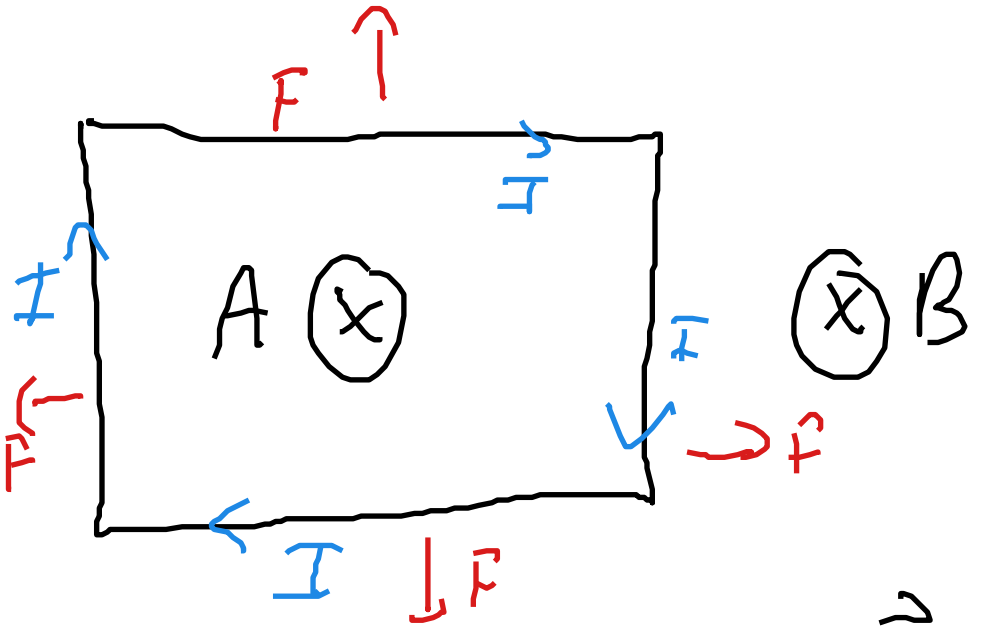
screw lightbulb in

apply τ



$$\tau = I\vec{A} \times \vec{B} = IAB \leftarrow$$

after it spins a while (top view)



$$\tau = I\vec{A} \times \vec{B} = 0$$

Point of stable equilibrium

$$\vec{F}_{net} = 0 \qquad \vec{\tau}_{net} = 0$$

put loop in another configuration it will tend to end up in this one

$\vec{A}$ ⊗ ⊗ $\vec{B}$

stable eq. when $\vec{A}$ & $\vec{B}$ point in the same direction just like a compass needle