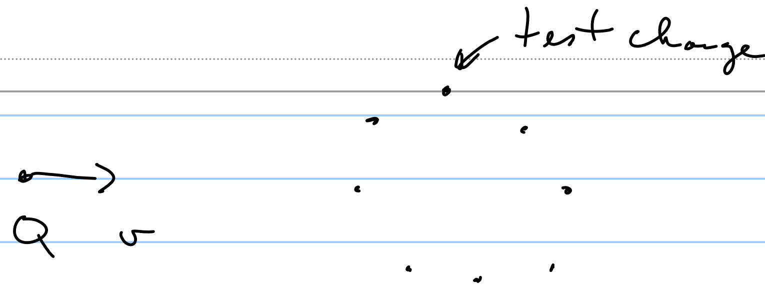
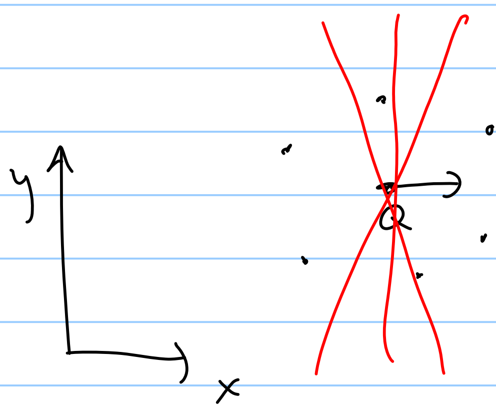
Note Title 4/1/2009

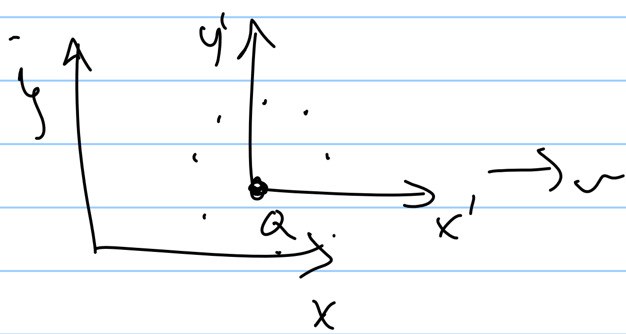
$\vec{F} = q\vec{E}$



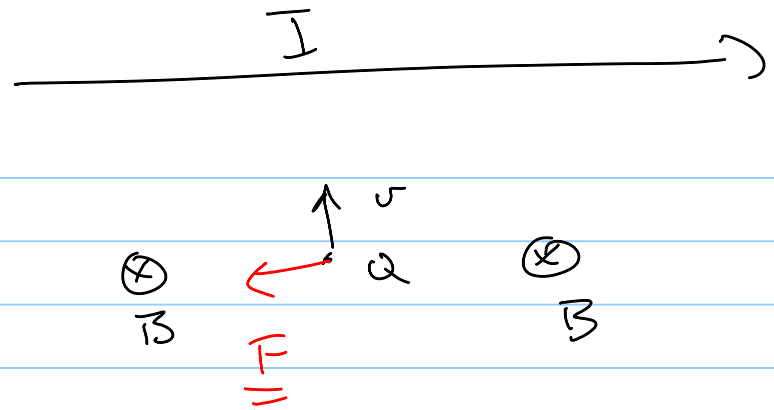

$$\oint \vec{E}\cdot d\vec{a} = \frac{Q_{enc}}{\epsilon_0}$$

Q invariant same in all ref. frames



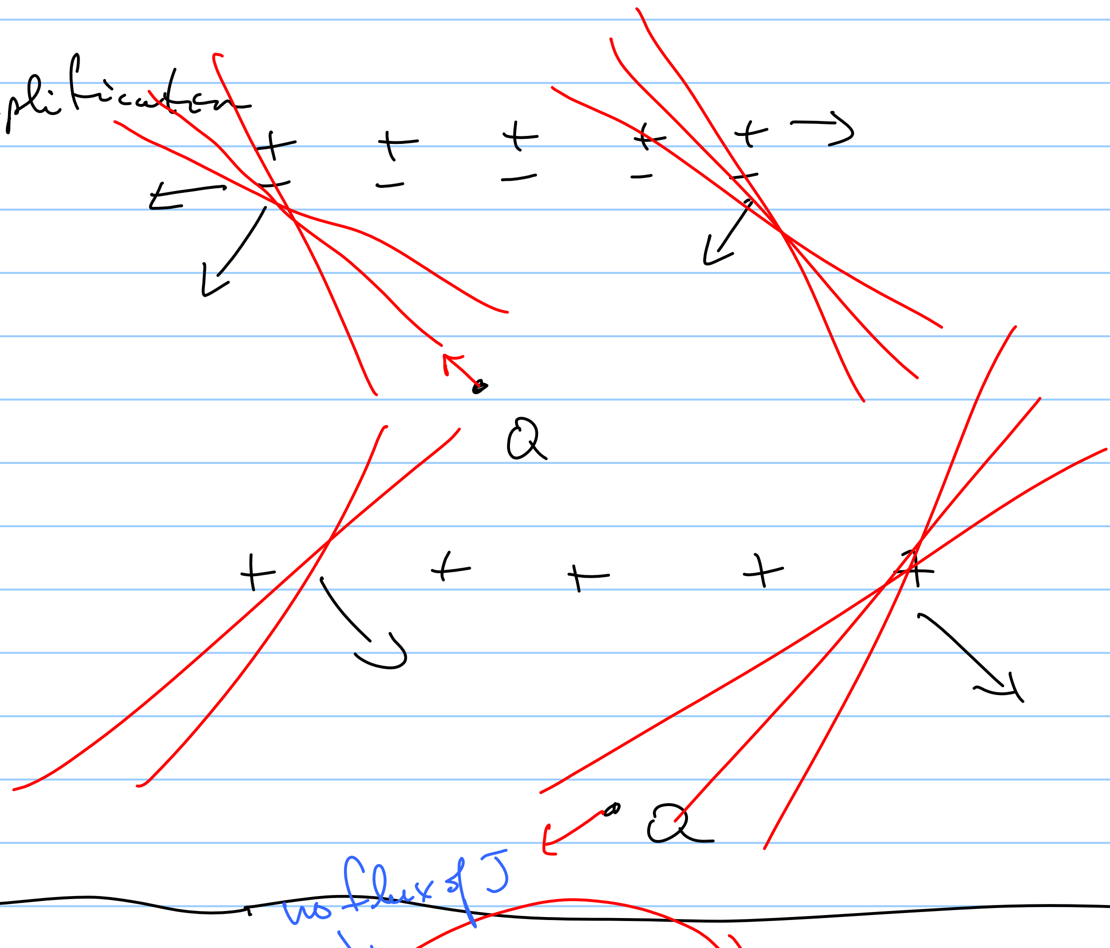

Charge conserved: $\vec{\nabla}\cdot\vec{J} = -\frac{\partial \rho}{\partial t}$

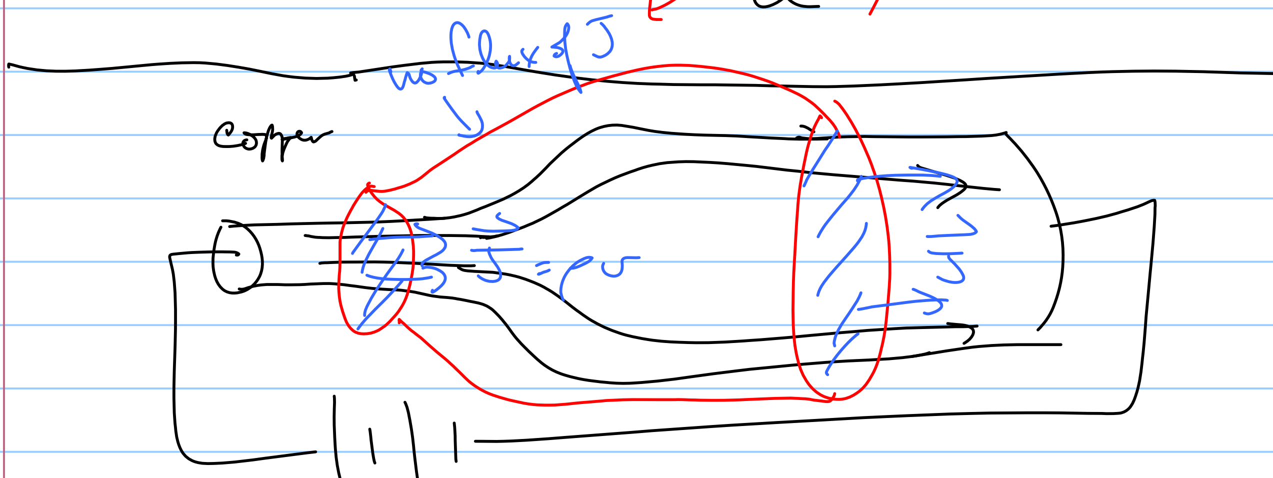
$$\oint \vec{J}\cdot d\vec{a} = -\frac{\partial}{\partial t}Q$$




In particle frame:


Simplification



Prin. $\vec{J} = \sigma \vec{E}$ ohm's $\Rightarrow \nabla^2 V = 0$

find E with bndry

Cons of charge

$$\nabla \cdot \vec{J} = -\frac{\partial \rho}{\partial t}$$

$$\oint \vec{J} \cdot d\vec{a} = -\frac{\partial Q_{end}}{\partial t} = 0$$

magneto static

$$\int \vec{J} \cdot d\vec{a} = J \int da = J_1 A_1$$

$$= 0$$

$$J_1 A_1 - J_2 A_2 = 0$$

$$\rho_1 v_1 A_1 - \rho_2 v_2 A_2 = 0$$

# free electron/atom const.

$$v_2 = \frac{v_1 A_1}{A_2}$$

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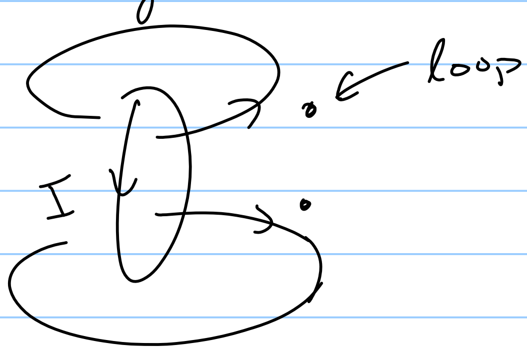
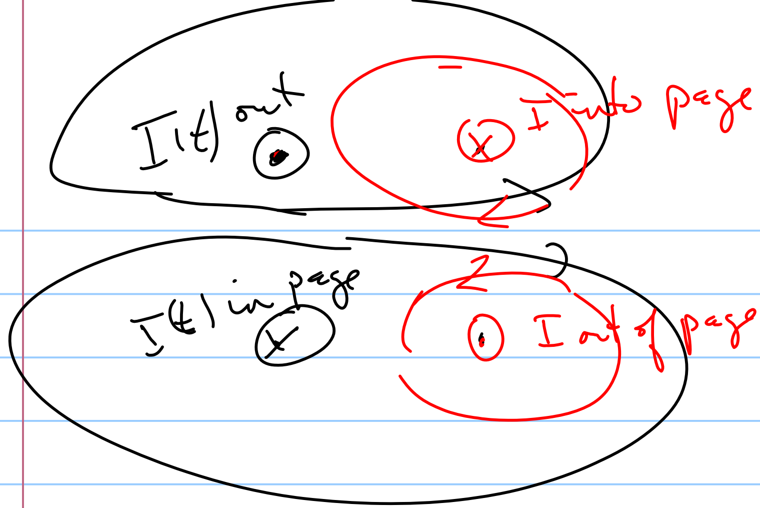
Faradays law

$$\mathcal{E}mf = -\frac{d \Phi_B}{dt}$$

Lenz's law






I(t) increases with time