ADDITIONAL ASSESSMENT

$$\nabla \cdot \underline{E} = \frac{1}{\varepsilon_0}\rho_e \qquad \nabla \times \underline{E} = -\frac{\partial \underline{B}}{\partial t} + 0 - \mu_0 \underline{J}_M$$

$$\nabla \cdot \underline{B} = 0\ \mu_0 \rho_m \qquad \nabla \times \underline{B} = \mu_0 \underline{J}_e + \mu_0 \varepsilon_0 \frac{\partial \underline{E}}{\partial t}$$

interesting, no? WHY ARE E & B NOT ON EQUAL FOOTING?

- note: SEEMS YOU CAN EVEN CHOOSE DIFF BASIS: $\underline{E}' = \underline{E}\cos\theta + \underline{B}\sin\theta$

ACTUALLY: not really : ρ_m IS A PSEUDOSCALAR (3T ODD)
$\underline{J}_m$ IS A PSEUDOVECTOR (2T EVEN)

→ OPPOSITE TO ρ_e & $\underline{J}_e$

→ PARTICLES W/ ELEC + MAG CHARGE VIOLATE PARITY.

cultural remarks:

- ∃ of magnetic monopole ⟷ [QUANTUM] EXPLANATION FOR DISCRETIZED CHARGE.
- MONOPOLES CAN ALSO BE UNDERSTOOD FROM THE PERSPECTIVE of THE TOPOLOGY of THE UNDERLYING GEOMETRIC PICTURE ("U(1) FIBER BUNDLE") → & ITS GENERALIZATIONS
- ELECTROMAGNETIC DUALITY IS A VERY POWERFUL TOOL IN THEORETICAL PHYSICS.

INTEGRAL FORM:

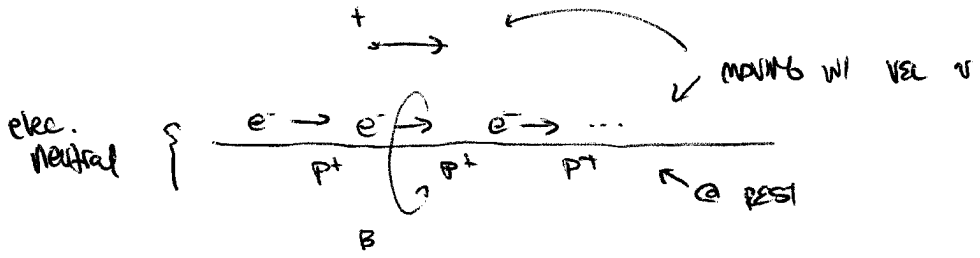
$$\oint \vec{E}\cdot d\underline{a} = q/\varepsilon_0 \qquad \oint \vec{E}\cdot d\underline{l} = -\frac{d\Phi_B}{dt}$$

$$\oint \vec{B}\cdot d\underline{a} = 0 \qquad \oint \vec{B}\cdot d\underline{l} = \mu_0 \underline{I} + \mu_0\varepsilon_0 \frac{\partial}{\partial t}\int \underline{E}\cdot d\underline{A}$$

... we're grown ups... use differential form.

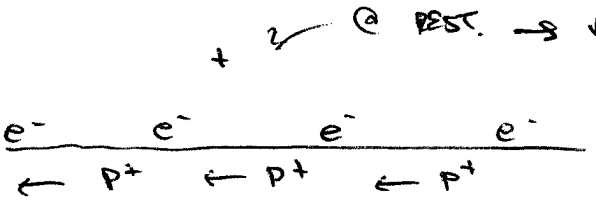
EVEN BETTER: $\boxed{dF = 0 \qquad d{*}F = j}$ w/ $F = \frac{1}{2}F_{\mu\nu}\,dx^\mu \wedge dy^\nu$

A THOUGHT EXPERIMENT



test charge feels magnetic force ~ $\vec{v} \times \vec{B}$
deflecting it from wire

IN FRAME of test charge:



→ WHAT GIVES?

Relativity: length contraction

p+ BECOME DENSE → ELECTRIC FORCE!