Normalizing the Maxwell Equations

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handout: Feynman

$$dJ = 0 \Longrightarrow \quad \frac{\partial \rho}{\partial t} + \operatorname{div} j = 0 \longrightarrow \quad \nabla \cdot \boldsymbol{j} = -\frac{\partial \rho}{\partial t}$$

$$dF = 0 \Longrightarrow \quad \operatorname{div} B = 0 \longrightarrow \quad \nabla \cdot \boldsymbol{B} = 0$$

$$\operatorname{curl} E = -\frac{\partial B}{\partial t} \longrightarrow \quad \nabla \times \boldsymbol{E} = -\frac{\partial \boldsymbol{B}}{\partial t}$$

$$d * F = J \Longrightarrow \quad \operatorname{div} E = -\rho \longrightarrow \quad \nabla \cdot \boldsymbol{E} = \frac{\rho}{\epsilon_0}$$

$$\operatorname{curl} B = -\frac{\partial E}{\partial t} + j \longrightarrow \quad c^2 \nabla \times \boldsymbol{B} = \frac{\boldsymbol{j}}{\epsilon_0} + \frac{\partial \boldsymbol{E}}{\partial t}$$

$$(*d*d + d*d*)\, dF =$$

$$\Delta V = -\operatorname{curl}\operatorname{curl} V + \operatorname{grad}\operatorname{div} V$$

$\epsilon_{mni}\, \epsilon_{ijk}\, \partial_j V_k$ (∂_n)

$\epsilon^{mil}\, \epsilon^{ljk}\, \partial_i \partial_j V_k \ldots$

at $i=j$, $k=m$, git

$\epsilon^{kil} \epsilon^{lik} =$

$-(\epsilon^{ikl})^2$

$\partial_m \quad \partial_n \quad V$

$$\Delta E = -\operatorname{curl}\left(-\frac{\partial B}{\partial t}\right) = +\frac{\partial}{\partial t}\operatorname{curl} B = -\frac{\partial^2 E}{\partial t^2}$$

$$\Delta B = -\operatorname{curl}\operatorname{curl} B = \ldots$$