

Electric Flux (H.1)

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$$D = \frac{Q}{4\pi r^2} a_r$$

$$E = \frac{Q}{4\pi \epsilon_0 r^2} a_r$$

$$D = \epsilon_0 E$$

$$E = \int_{\text{vol}} \frac{\rho_v dV}{4\pi \epsilon_0 R^2} a_r$$

$$E = \int_{\text{vol}} \frac{\rho_v dV}{4\pi R^2} a_r$$

$$E_p = \frac{\rho_L}{2\pi \epsilon_0 \rho}$$

$$E = \frac{\rho_L}{2\pi \epsilon_0 \rho} a_\rho$$

$$E = \frac{\rho_s}{2 \epsilon_0} a_N$$

$$\Psi = \oint_S \mathbf{D}_S \cdot d\mathbf{S} = Q$$

$$\oint_S \mathbf{D}_S \cdot d\mathbf{S} = \int_{\text{vol}} \rho_r dV$$

$$Q = \oint_S \mathbf{D}_S \cdot d\mathbf{S}$$

$$\mathbf{D} = \frac{Q}{4\pi r^2} \mathbf{a}_r$$

$$\mathbf{E} = \frac{Q}{4\pi\epsilon_0 r^2} \mathbf{a}_r$$

$$\mathbf{D} = \frac{\rho_L}{2\pi r} \mathbf{a}_r$$

$$Q = \oint_S \mathbf{D}_s \cdot d\mathbf{S}$$

$$\text{Charge enclosed in volume } \Delta v = \frac{\partial D_x}{\partial x} + \frac{\partial D_y}{\partial y} + \frac{\partial D_z}{\partial z}$$

$$\text{Divergence of } \mathbf{A} = \text{div } \mathbf{A} = \lim_{\Delta v \rightarrow 0} \frac{\oint \mathbf{A} \cdot d\mathbf{S}}{\Delta v}$$

$$\text{div } \mathbf{D} = \left(\frac{\partial D_x}{\partial x} + \frac{\partial D_y}{\partial y} + \frac{\partial D_z}{\partial z} \right)$$

$$= \frac{1}{\rho} \frac{\partial}{\partial \rho} (\rho D_\rho) + \frac{1}{\rho} \frac{\partial}{\partial \phi} D_\phi + \frac{\partial}{\partial z} D_z$$

$$= \frac{1}{r^2} \frac{\partial}{\partial r} (r^2 D_r) + \frac{1}{r \sin \theta} \frac{\partial}{\partial \theta} (\sin \theta D_\theta) + \frac{1}{r \sin \theta} \frac{\partial}{\partial \phi} D_\phi$$

$$\text{div } \mathbf{D} = \rho_v$$

$$\nabla = \frac{\partial}{\partial x} \mathbf{a}_x + \frac{\partial}{\partial y} \mathbf{a}_y + \frac{\partial}{\partial z} \mathbf{a}_z$$

$$\operatorname{div} \mathbf{D} = \nabla \cdot \mathbf{D} = \frac{\partial D_x}{\partial x} + \frac{\partial D_y}{\partial y} + \frac{\partial D_z}{\partial z}$$

$$\oint_S \mathbf{D} \cdot d\mathbf{S} = \int_{\text{vol}} \nabla \cdot \mathbf{D} \, dV$$