
Maxwell's Equations
Lorentz force

Electrostatics

$\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$ $\quad \vec{\nabla} \times \vec{E} = 0$

time independent

$|\vec{x} - \vec{x}'|^3$ $\quad \frac{1}{4\pi\epsilon_0}$

$\rho(\vec{x})$ charge density

$\rho(\vec{x}) = q\,\delta(\vec{x} - \vec{x}_1)$

Dirac delta function

for point charge at $\vec{x} = \vec{x}_1$

$|\vec{x} - \vec{x}'| = (x^2 + x'^2 - 2\vec{x}\cdot\vec{x}')^{1/2}$

$\frac{\vec{x} - \vec{x}'}{|\vec{x} - \vec{x}'|^3} = -\vec{\nabla}\frac{1}{|\vec{x} - \vec{x}'|}$

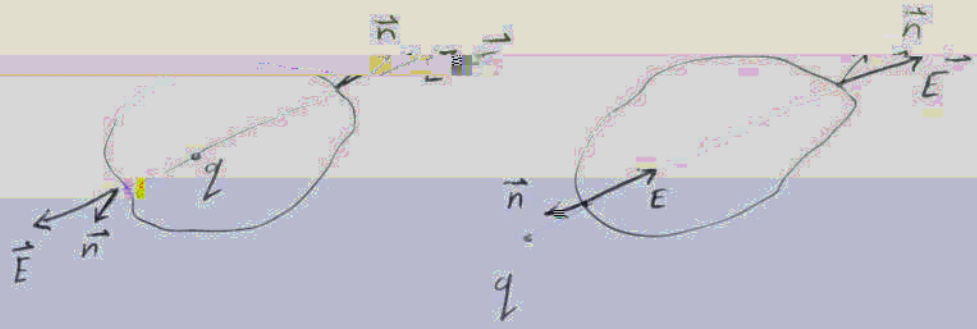
Apple

Divergence Theorem

$$\oint_S \vec{F} \cdot \vec{n}\, da = \int_V \vec{\nabla} \cdot \vec{F}\, d^3x \qquad \vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$$

Gauss's Law $\oint_S \vec{E} \cdot \vec{n}\, da = \frac{1}{\epsilon_0} \int_V \rho(\vec{x})\, d^3x$

$$d\Omega = \frac{da \cos\theta}{r^2}$$



$$\vec{E} \cdot \vec{n}\, da = \frac{q}{4\pi\epsilon_0} \frac{\cos\theta\, da}{r^2} = \frac{q}{4\pi\epsilon_0} d\Omega$$

ing... $\vec{E}(\vec{x}) = -\frac{1}{4\pi\epsilon_0} \vec{\nabla} \int \frac{\rho(\vec{x}')}{|\vec{x} - \vec{x}'|} d^3x'$ continu

so $\Phi(\vec{x}) = \frac{1}{} \int \frac{\rho(\vec{x}')}{} d^3x'$