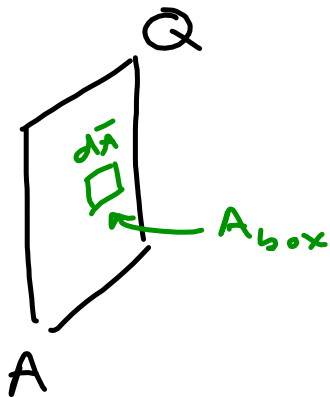


## Electric Field of Charged Plate

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$$\oint \vec{E} \cdot d\vec{A} = \frac{q_{\text{inside}}}{\epsilon_0}$$

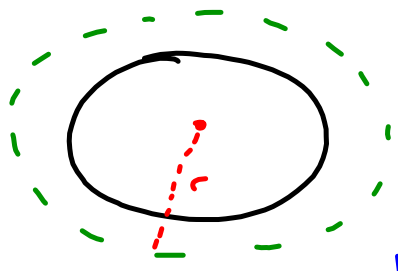
$$|\vec{E}|_{\text{left}} A_{\text{box}} + |\vec{E}|_{\text{right}} A_{\text{box}} = \frac{q_{\text{inside}}}{\epsilon_0}$$

$$2 |\vec{E}| \cancel{A_{\text{box}}} = \frac{Q \left( \frac{\cancel{A_{\text{box}}}}{A} \right)}{\epsilon_0}$$

$$|\vec{E}| = \frac{Q/A}{2\epsilon_0}$$

## Electric Field of Uniformly Charged Spherical shell

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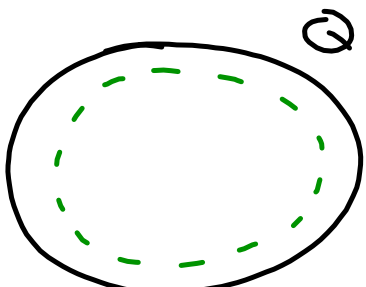
A diagram showing a solid black circle representing a spherical shell. Inside it, a dashed green circle represents a Gaussian surface. A red dashed line from the center to the Gaussian surface is labeled 'r'.

$$\oint \vec{E} \cdot d\vec{A} = \frac{q_{\text{inside}}}{\epsilon_0}$$

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

$$|\vec{E}| = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2}$$


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A diagram showing a solid black circle representing a spherical shell with a 'Q' above it. A dashed green circle represents a Gaussian surface outside the shell.

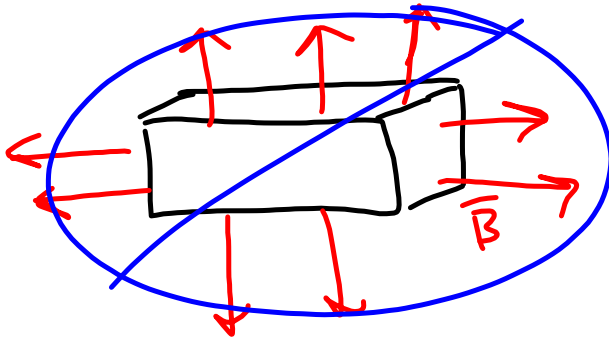
$$\oint \vec{E} \cdot d\vec{A} = \frac{q_{\text{inside}}}{\epsilon_0}$$

$$|\vec{E}| (4\pi r^2) = \frac{\emptyset}{\epsilon_0}$$

$$|\vec{E}| = \emptyset$$

## "Gauss's Law for Magnetism"

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Magnetic monopoles  
do not exist (as  
far as we know)

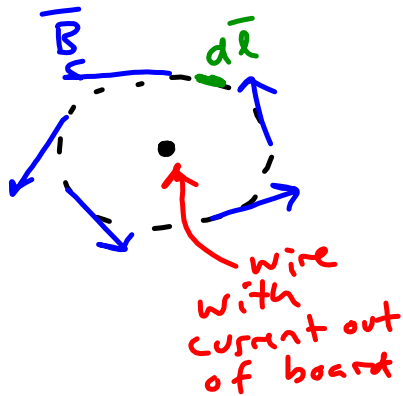
$$\oint \vec{B} \cdot d\vec{A} = 0$$

## Ampere's Law

$$B_{\text{wire}} = \frac{\mu_0}{4\pi} \frac{2I}{r}$$

$$\oint \vec{B} \cdot d\vec{\ell} = \frac{\mu_0}{4\pi} \frac{2I}{r} \oint d\ell$$

circle, so  
 $\ell = 2\pi r$



$$\oint \vec{B} \cdot d\vec{\ell} = \left( \frac{\mu_0}{4\pi} \frac{2I}{r} \right) (2\pi r)$$

$$\oint \vec{B} \cdot d\vec{\ell} = \mu_0 I$$

Ampere's Law:

$$\oint \vec{B} \cdot d\vec{\ell} = \mu_0 \sum I_{\text{inside path}}$$

