Gauss' Law

$\vec{A}$ = Area Vector, always $\perp$ to face

$\mathrm{I}_E = \vec{E} \cdot \vec{A} = EA\cos\theta$

$\mathrm{I}_E = \int \vec{E} \cdot d\vec{A}$

$$\mathrm{I}_E = \frac{q_{\text{enc}}}{\varepsilon_0}$$

$$\lambda = \frac{q}{l}$$

$$\mathrm{I}_E = \frac{\lambda l}{\varepsilon_0}$$

$E_{\text{gaussian cylinder}} = \dfrac{q}{2\pi\varepsilon_0 rl} = \dfrac{\lambda}{2\pi r\varepsilon_0}$, from $A = 2\pi rl$, sides of cylinder

$$k = \frac{1}{4\pi\varepsilon_0}$$

$$\varepsilon_0 = 8.854 \times 10^{-12} \frac{\mathrm{C}^2}{\mathrm{Nm}^2}$$

σ = area charge density

$\sigma = \dfrac{q}{A} = \dfrac{q_{\text{enc}}}{dA}$, units: $\dfrac{\mathrm{C}}{\mathrm{m}^2}$

Inside gaussian sphere: $E = \dfrac{kqr}{R^3}$, little r inside