## Gauss' Law

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

$$I_E = \vec{E} \cdot \vec{A} = EA \cos \theta$$

$$egin{aligned} & \mathbf{I}_E = ec{E} \cdot ec{A} = EA\cos heta \ & \mathbf{I}_E = \int ec{E} \cdot dec{A} \end{aligned}$$

$${
m I}_E = rac{q_{
m enc}}{arepsilon_0}$$

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

$${
m I}_E=rac{\lambda l}{arepsilon_0}$$

 $E_{
m gaussian~cylinder}=rac{q}{2\piarepsilon_0 rl}=rac{\lambda}{2\pi rarepsilon_0}$  , from  $A=2\pi rl$  , sides of cylinder

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

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

 $\sigma = \text{area charge density}$ 

$$\sigma = \frac{q}{A} = \frac{q_{\rm enc}}{dA}$$
 , units:  $\frac{\rm C}{\rm m^2}$ 

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