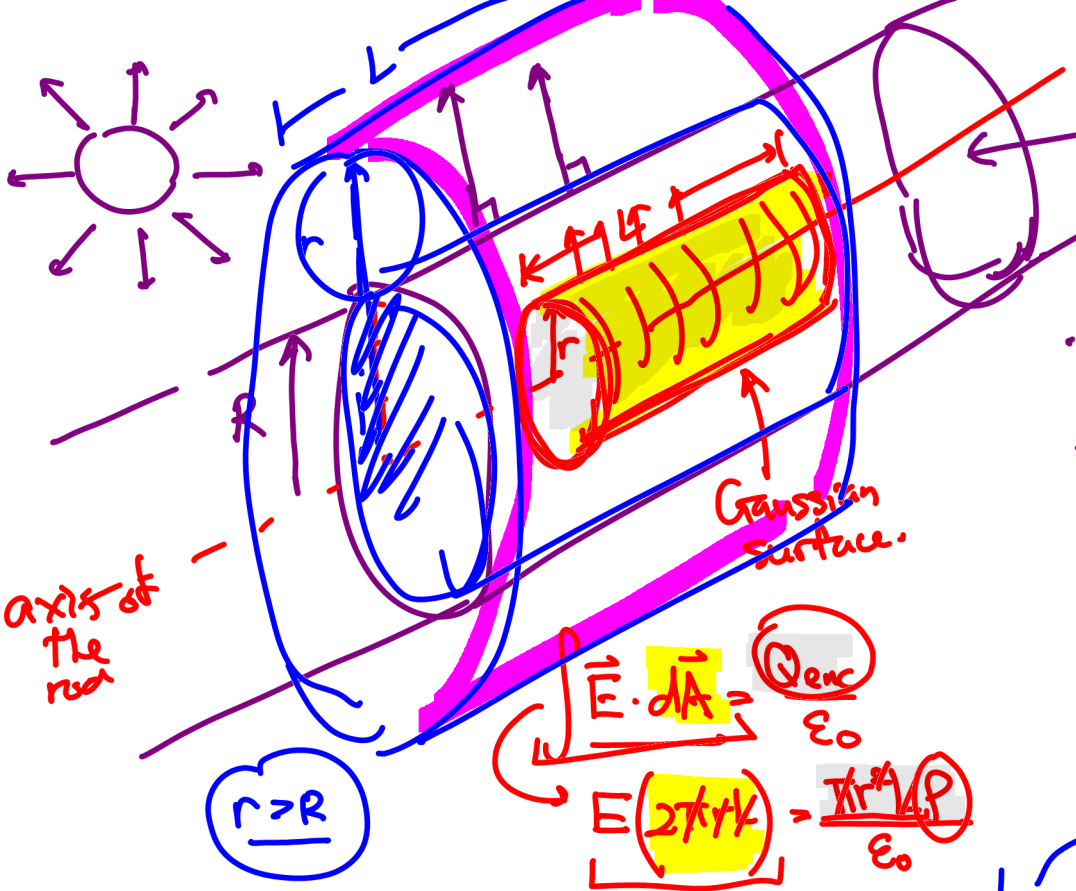

Infinitely long charged rod with a constant charge density of ρ.

- What is electric field inside the rod?
- what is the electric field outside of the rod??

$$\int \vec{E}\cdot d\vec{A} = \frac{Q_{enc}}{\varepsilon_0}$$

$$E(2\pi r l) = \frac{\pi r^2 l \rho}{\varepsilon_0}$$

$$2E = \frac{\rho r}{\varepsilon_0} \rightarrow E = \frac{\rho r}{2\varepsilon_0} \propto r$$

$$\int E\cdot dA = \frac{Q_{enc}}{\varepsilon_0}$$

$$E\cdot(2\pi r l) = \frac{\pi R^2 \Delta \rho}{\varepsilon_0} \rightarrow E = \left[\frac{\rho R^2}{2\varepsilon_0}\right]\frac{1}{r} \rightarrow E \propto \frac{1}{r}$$