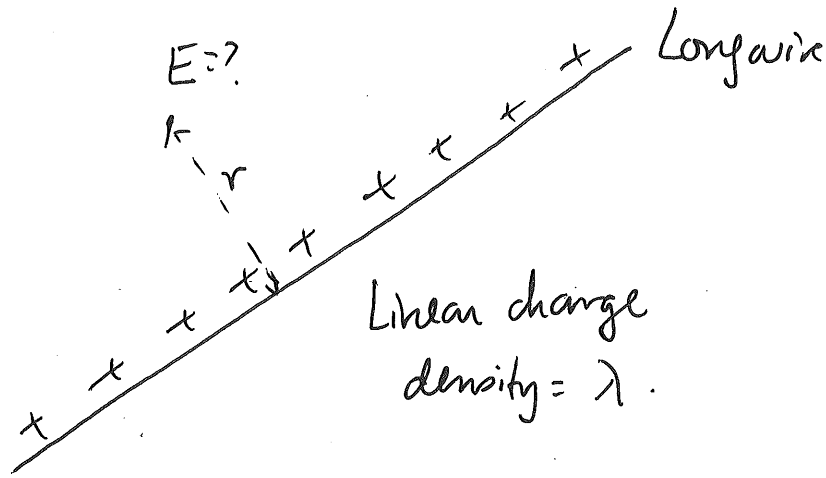
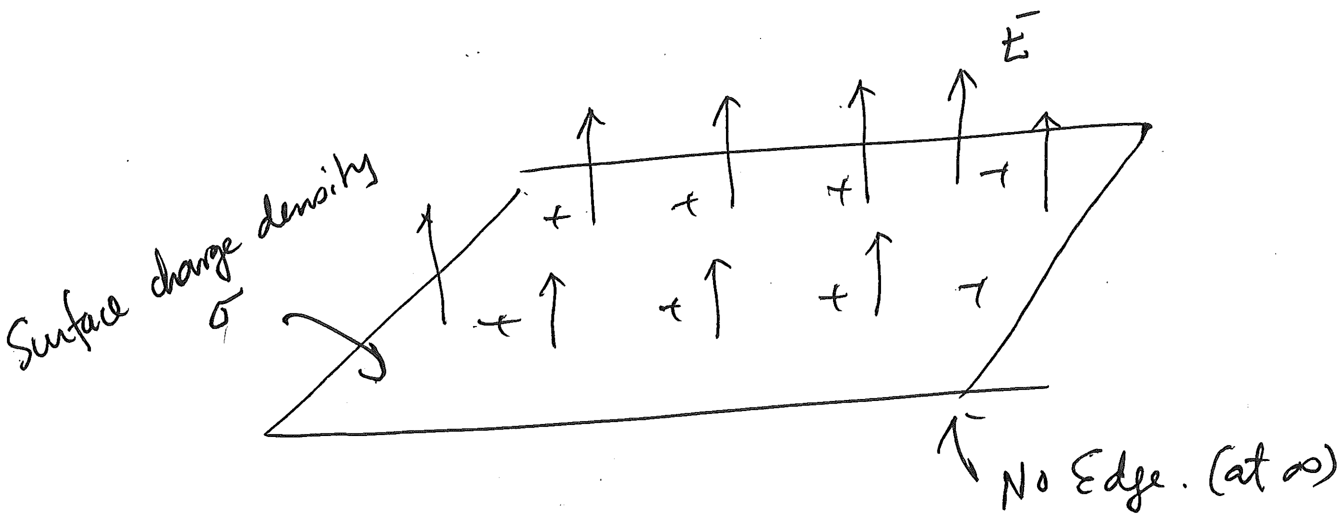


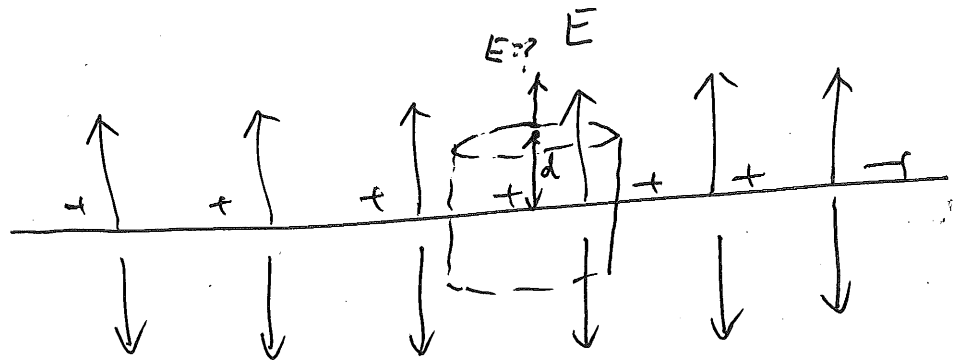
Linear charge density = λ.

$$\varepsilon_0 E \cdot 2\pi r \cdot L = \lambda L.$$

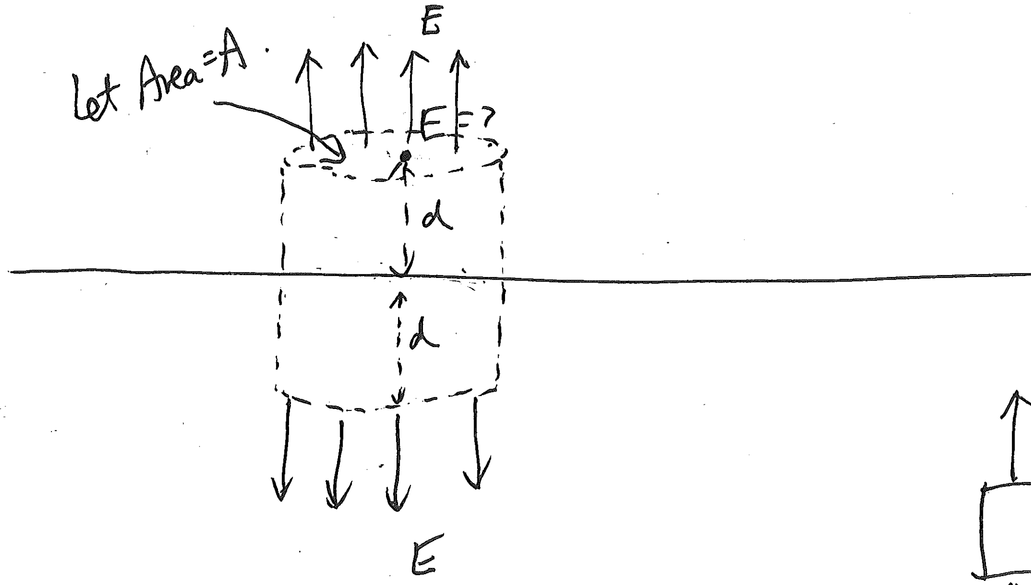
$$E = \frac{1}{2\pi\varepsilon_0}\frac{\lambda}{r}.$$

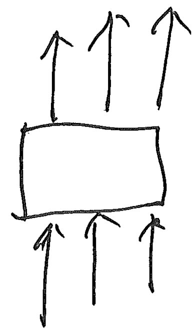


Side view:



pill box

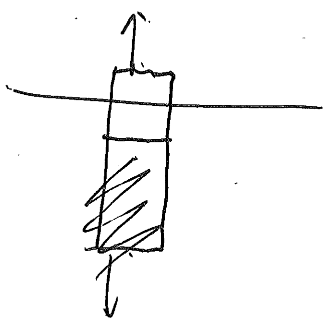




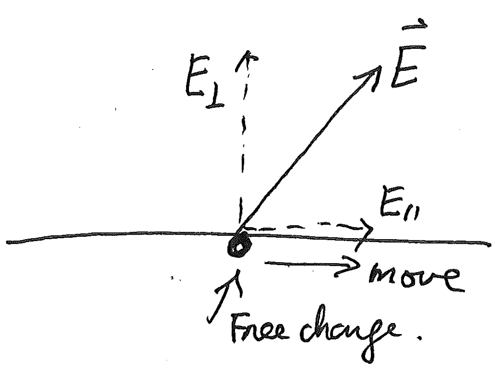
$$\varepsilon_0 \underbrace{(EA+EA)}_{\text{Flux}=2EA} = \sigma A$$

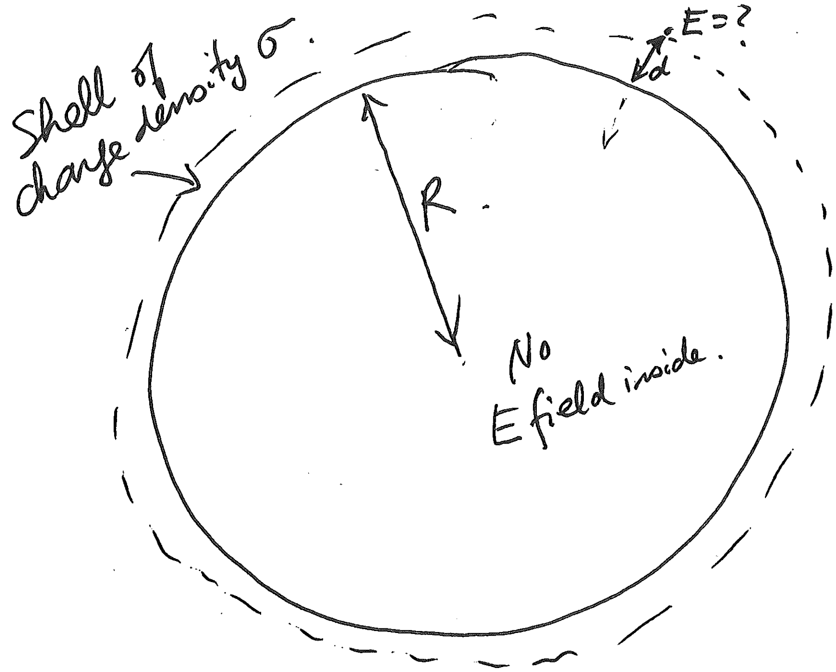
$$\Rightarrow E = \frac{\sigma}{2\varepsilon_0}.$$

E is independent of height!



Constant (uniform) E field!!





$\cancel{\varepsilon_0 / 4\pi\varepsilon_0}$

$$\varepsilon_0 \cdot E \cdot 4\pi (R+d)^2 = \sigma \cdot 4\pi R^2 .$$

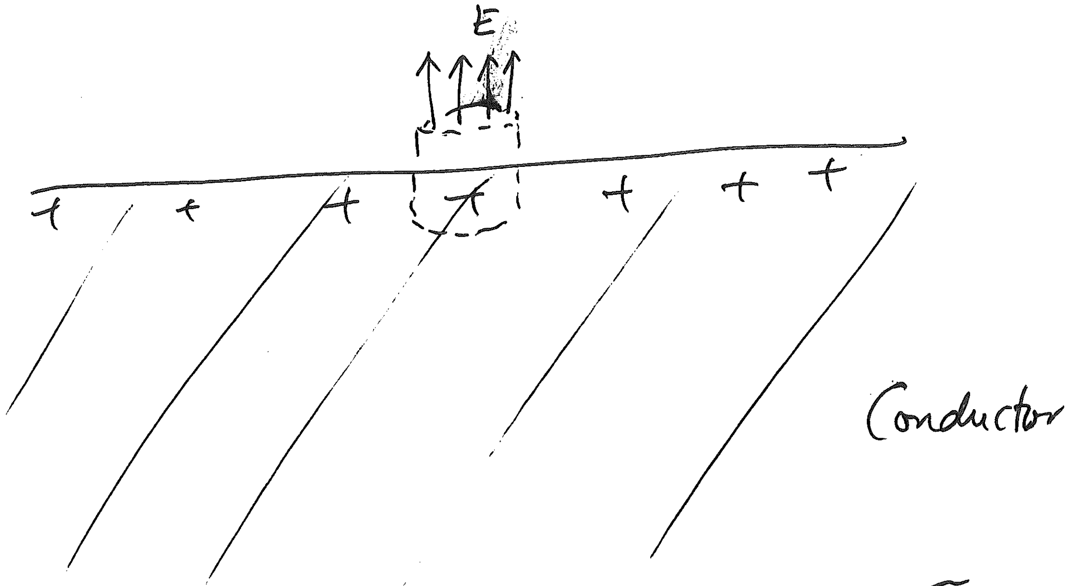
$$E = \frac{\sigma}{\varepsilon_0} \cdot \frac{R^2}{(R+d)^2}$$

$$= \frac{\sigma}{\varepsilon_0} \cdot \frac{1}{\left(1+\frac{d}{R}\right)^2}$$

$d \ll R$. $\frac{d}{R} \ll 1$. $E = \frac{\sigma}{\varepsilon_0}$.

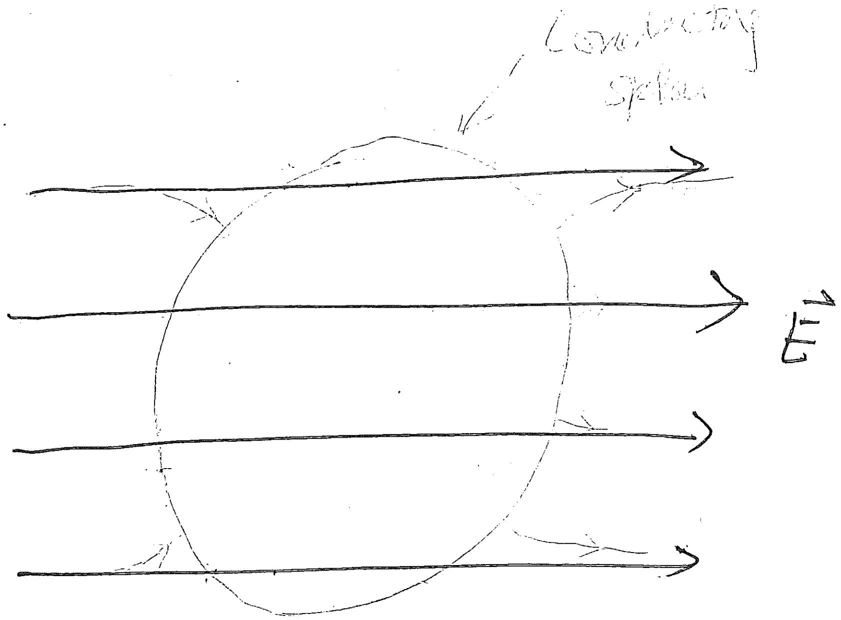
$$E \sim \frac{\sigma}{\varepsilon_0}\left(1 - \frac{2d}{R} + \cdots\right)$$

Calculation works also for a <u>solid</u> <u>conducting</u> <u>sphere</u>!

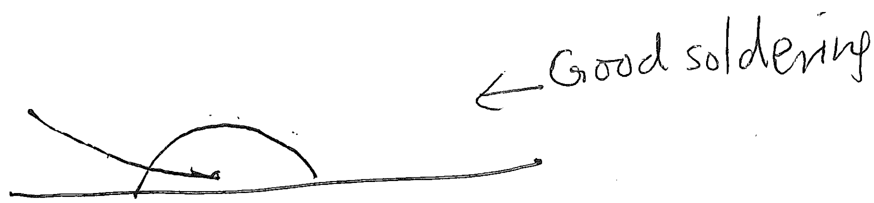


$$\varepsilon_0 EA = A\sigma. \Rightarrow E = \frac{\sigma}{\varepsilon_0}.$$

For conducting surface!


Conducting sphere
E


Wire
← Bad soldering.


← Good soldering