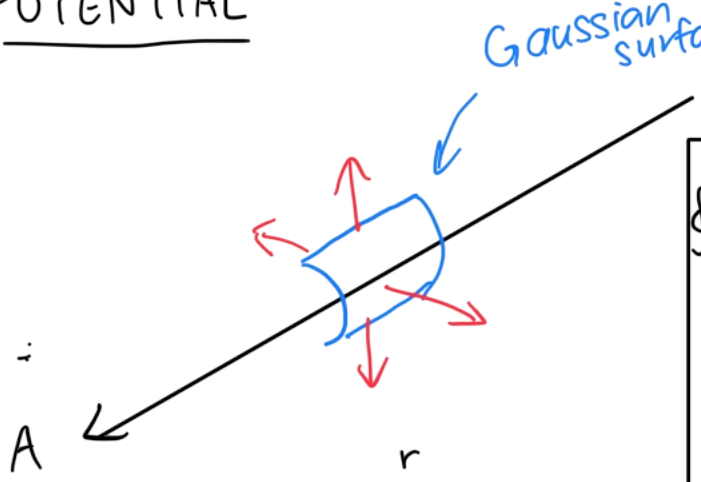
POTENTIAL



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

$$E \cdot 2\pi r l = \frac{\lambda l}{\varepsilon_0}$$

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

not infinite because stuff cancels

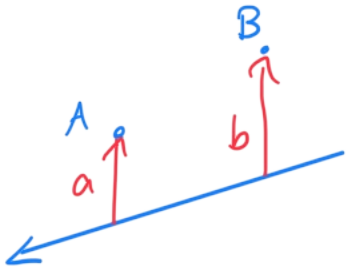
$$V(r) = -\int_{\infty}^{r} \frac{\lambda}{2\pi\varepsilon_0 r}\, dr$$

$$= \frac{-\lambda}{2\pi\varepsilon_0} \ln|r| \Big|_{\infty}^{r}$$

$$= \infty$$

infinite amount of work done b/c we have infinite charge

POTENTIAL DIFF



$$\Delta V_{ab} = -\int_{a}^{b} \frac{\lambda}{2\pi\varepsilon_0 r}\, dr$$

$$= -\frac{\lambda}{2\pi\varepsilon_0} \int_{a}^{b} \frac{dr}{r} = -\frac{\lambda}{2\pi\varepsilon_0} \ln r \Big|_{a}^{b}$$

$$= -\frac{\lambda}{2\pi\varepsilon_0} (\ln b - \ln a)$$

$$= -\frac{\lambda}{2\pi\varepsilon_0} \ln\frac{b}{a}$$