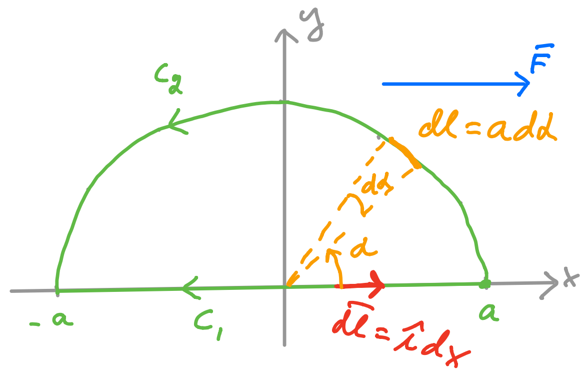
Viivaintegraaliesimerkki:

Laske $W = \int_a^{-a} \bar{F} \cdot d\bar{l}$, $\bar{F} = F_0 \hat{i}$

polkuja C_1 ja C_2 pitkin.



$\underline{C_1}$:

$$W_1 = \int_a^{-a} F_0 \hat{i} \cdot \hat{i} dx = F_0 \int_a^{-a} dx = \underline{\underline{-2aF_0}}$$

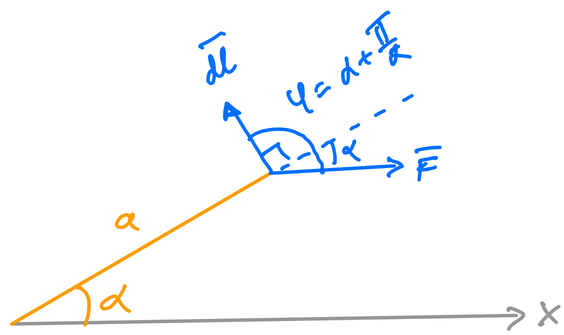
$\underline{C_2}$:

$$W_2 = \int_0^{\pi} F_0 \cos\left(\alpha + \frac{\pi}{2}\right) a\, d\alpha$$

$$= aF_0 \int_0^{\pi} \cos\left(\alpha + \frac{\pi}{2}\right) d\alpha$$

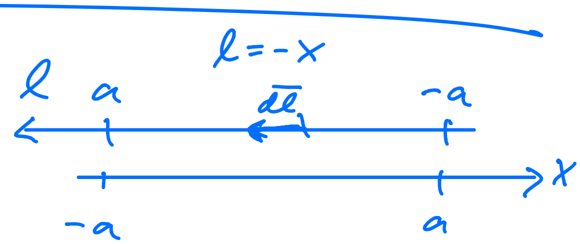
$$= aF_0 \Big/_0^{\pi} \sin\left(\alpha + \frac{\pi}{2}\right)$$

$$= \underline{\underline{-2aF_0}}$$



$W_1 = W_2$ koska $\bar{F}$ on konservatiivinen

C_1: $\quad d\bar{l} = -\hat{i}\, dl$

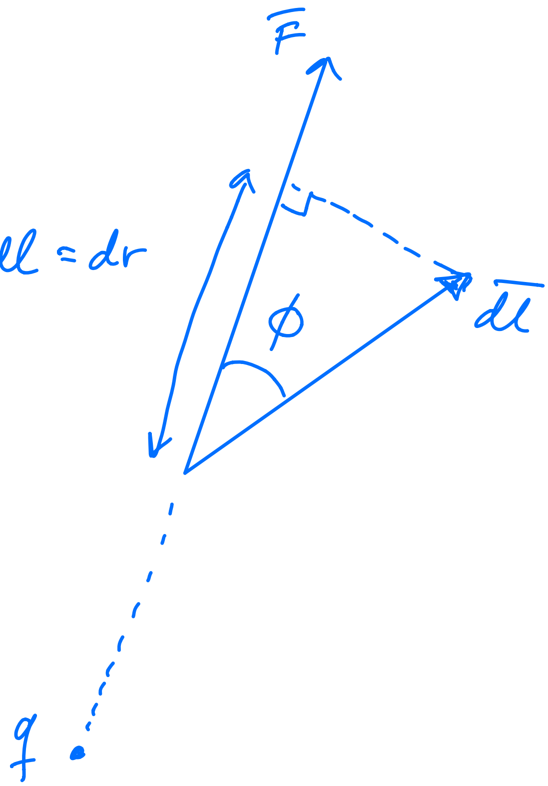


$$W_1 = \int_{-a}^{a} F_0 \hat{i} \cdot (-\hat{i})\, dl$$

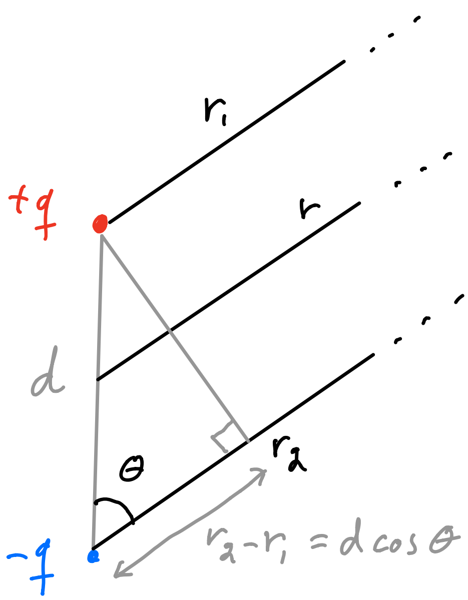
$$= -F_0 \int_{-a}^{a} dl = \underline{\underline{-2aF_0}}$$

[Kalvo 10]

$\cos\phi \, dl = dr$



Dipolin potentiaali kaukana



$$V = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{r_1} - \frac{q}{r_2}\right)$$

$$= \frac{q}{4\pi\varepsilon_0} \frac{r_2 - r_1}{r_1 r_2}$$

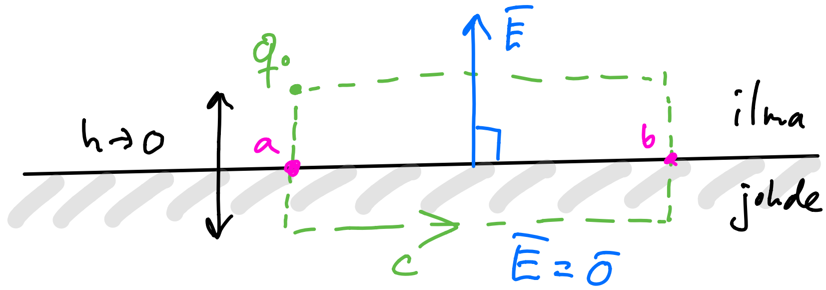
$$= \frac{q d \cos\theta}{4\pi\varepsilon_0 \, r^2}$$

$$= \frac{p \cos\theta}{4\pi\varepsilon_0 \, r^2}$$

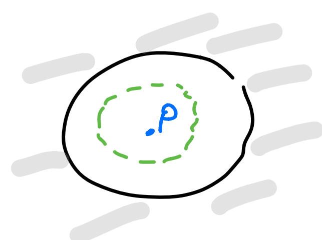
$\boxed{\text{kun } r >> d}$

[Kalvoon 25 liittyvä kuva]

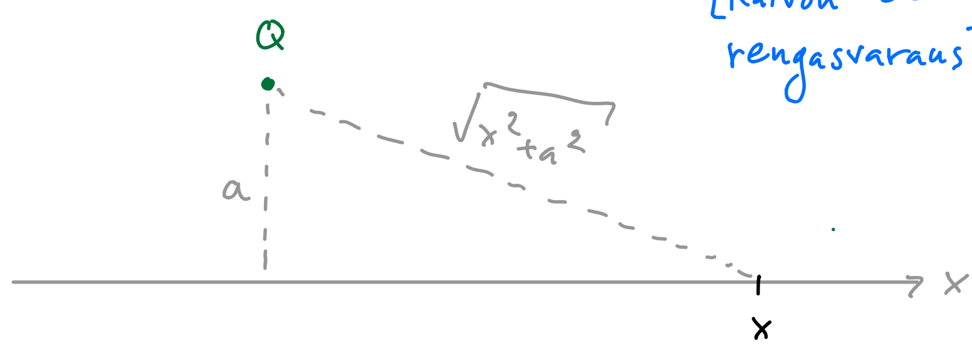
$$W = q_0 \oint_c \bar{E} \cdot d\bar{l} = 0$$



[Kalvo 26]



[Kalvon 30 rengasvaraus]



$$V = \frac{1}{4\pi\varepsilon_0} \frac{Q}{\sqrt{x^2 + a^2}}$$