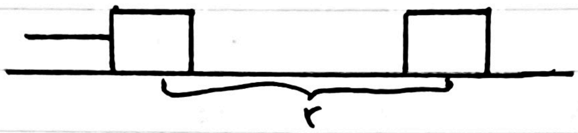
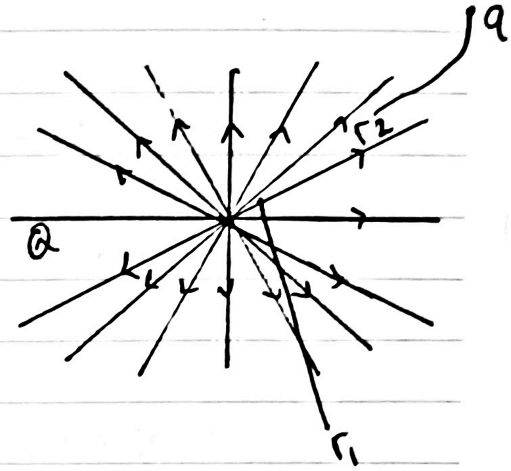
No.

Date 22 . Apr'. 24.

→ Usaha dalam listrik statis.

$$W = \int F\,dr \rightarrow \vec{dr}$$





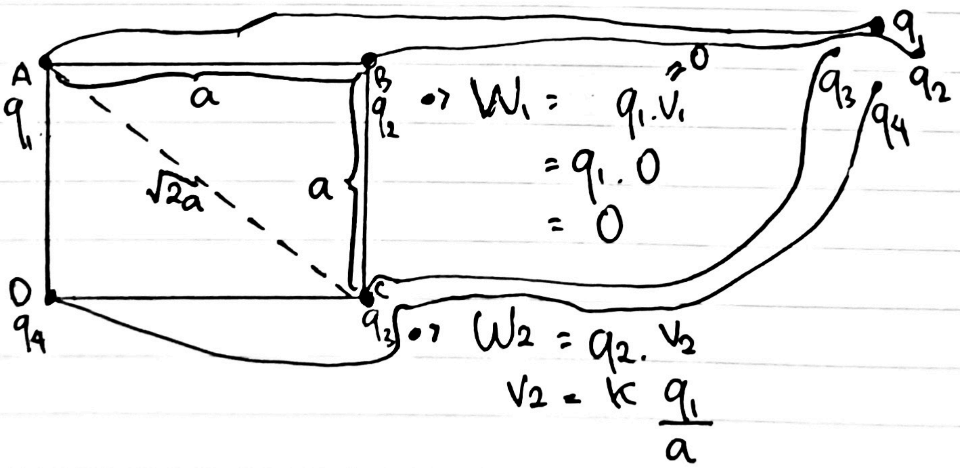
$$W = \int F\,dr$$
$$W = -q\int E\,dr$$
$$W = -q\left[-k\frac{Q}{r}\right] = qV$$

$$\boxed{W = qV}$$

NOTE :
Teorema phytagoras:
$a^2 = \sqrt{a^2+a^2}$
$a = a\sqrt{2}$

Contoh :

1.



$\rightarrow W_1 = q_1.\overset{=0}{V_1}$
$= q_1 . 0$
$= 0$

$\rightarrow W_2 = q_2 . V_2$
$V_2 = k\dfrac{q_1}{a}$

$$W_2 = kq_2\frac{q_1}{a} = k\frac{q_1 q_2}{a}$$

$\Rightarrow W_3 = q_3 . V_3$

$$V_3 = k \frac{q_1}{\sqrt{2}a} + k \frac{q_2}{a}$$

$$W_3 = k \left[\frac{q_1 . q_3}{\sqrt{2}a} + \frac{q_2 . q_3}{a} \right]$$

$\Rightarrow W_4 = q_4 . V_4$

$$V_4 = k \left[\frac{q_1}{a} + \frac{q_2}{\sqrt{2}a} + \frac{q_3}{a} \right]$$

$$W_4 = k \left[\frac{q_1 . q_4}{a} + \frac{q_2 . q_4}{\sqrt{2}a} + \frac{q_3 . q_4}{a} \right]$$

$\Rightarrow W_t = W_1 + W_2 + W_3 + W_4$

$$W_t = \sum_{i=1}^{n} \sum_{j\neq i}^{n} q_i \frac{q_j}{4\pi\varepsilon_0 r_{ij}}$$

$$W_t = \frac{1}{8\pi\varepsilon_0} \sum_{i=1}^{n} q_i \sum_{j\neq i}^{n} \frac{q_j}{r_{ij}}$$

$$W_t = \frac{1}{2} \sum_{i=1}^{n} q_i \sum_{j\neq i}^{n} \frac{1}{4\pi\varepsilon_0 r_{ij}} q_j$$

$$W_t = \frac{1}{2} \sum_{i=1}^{n} q_i \sum_{j\neq i}^{n} V_j$$

$$W = \frac{1}{2} \sum_{i=1}^{n} q_i \sum_{j\neq i}^{n} V_j$$

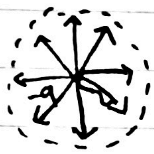
→ $W = \frac{1}{2}\int \lambda V \, d\vec{r}$ => potensial oleh muatan pada garis. → (lipat 1)

→ $W = \frac{1}{2}\int \sigma V \, d\vec{s}$ => potensial oleh muatan pada permukaan. → (lipat 2)

→ $W = \frac{1}{2}\int \rho V \, d\sigma$ => potensial oleh muatan pada volume. → (lipat 3).

Persamaan Hukum Gauss dalam bentuk diferensial.

$\rho = \varepsilon_0 . \nabla . \vec{E}$ → $\nabla . \vec{E} = \frac{\rho}{\varepsilon_0}$



$$\oint E \, d\vec{A} = \frac{Q}{\varepsilon_0}$$

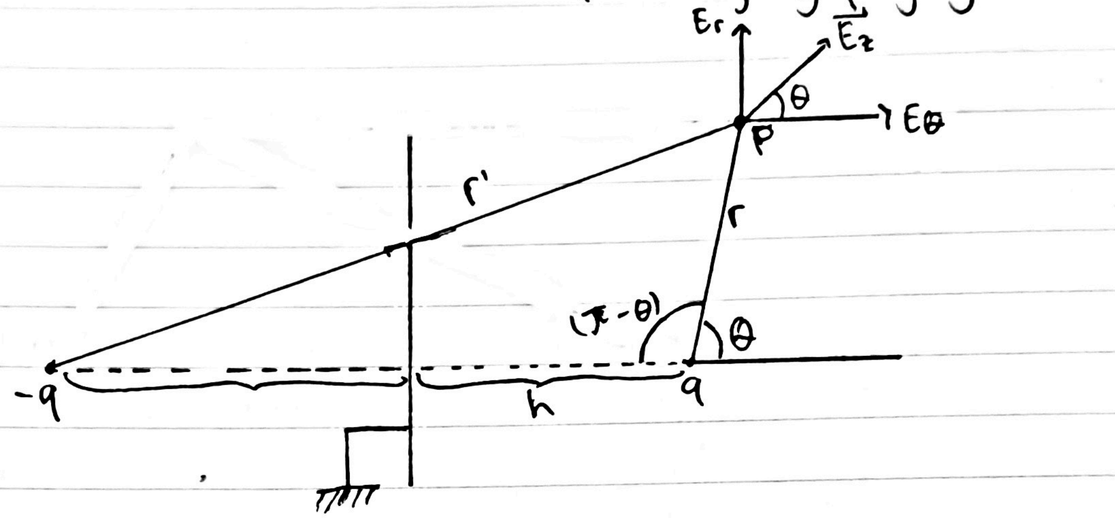
Sehingga,

$$W = \frac{\varepsilon_0}{2}\int (\nabla . E) V d\sigma$$

$$W = \frac{\varepsilon_0}{2}\int E^2 \, d\sigma$$

Bab III : "Metode Bayangan"

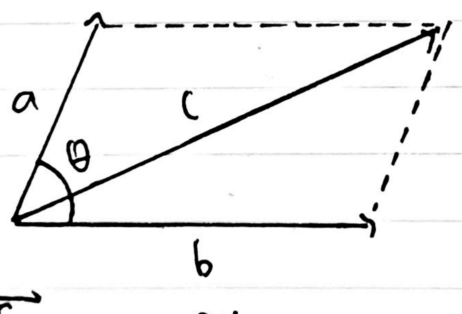
*kawat yang panjang sekali.



$$V_P = k\left[\frac{q}{r} + \frac{-q}{r'}\right]$$

$$V_P = kq\left[\frac{1}{r} - \frac{1}{(r^2+(2h)^2+4hr\cos(\pi-\theta))^{1/2}}\right]$$

$$V_P = kq\left[\frac{1}{r} - \frac{1}{(r^2+4h^2+4hr\cos\theta)^{1/2}}\right]$$



$$\boxed{\begin{aligned} \frac{1}{r} &= -r^{-1}\, dr \\ &= -r^{-1-1} \\ &= -r^{-2} = \frac{1}{r^2} \end{aligned}}$$

* $$\vec{E}_r = -\frac{\partial V}{\partial r}$$

$$= -kq\left[\frac{1}{r^2} - \frac{-\frac{1}{2}(r^2+4h^2+4hr\cos\theta)^{-1/2}(2r+4h\cos\theta)}{(r^2+4h^2+4hr\cos\theta)}\right]$$

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$$\vec{E_r} = kq\left[\frac{1}{r^2} - \frac{(r+2h\cos\theta)}{(r^2+4h^2+4hr\cos\theta)^{3/2}}\right]$$

$$= \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r^2} - \frac{(r+2h\cos\theta}{(r^2+4h^2+4hr\cos\theta)^{3/2}}\right]$$

$$* \vec{E_\theta} = \frac{\partial v}{\partial \theta}$$

$$= -kq\left[-\frac{1/2\,(r^2+4h^2+4hr\cos\theta)^{-1/2}\cdot 4hr\sin\theta}{(r^2+4h^2+4hr\cos\theta)^{1}}\right]$$

$$= kq\left[\frac{2hr\sin\theta}{(r^2+4h^2+4hr\cos\theta)^{3/2}}\right]$$