No 1
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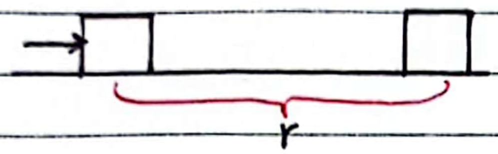
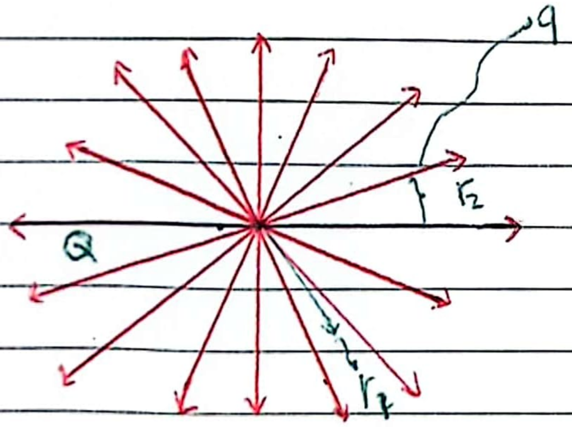
KALISMA

USAHA DAN ENERGI

$W = \int F \cdot dr \rightarrow d\vec{r}$

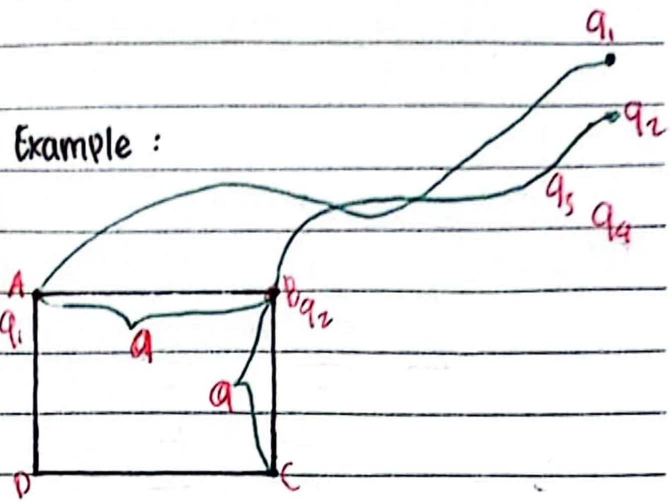




$$W = \int F \cdot dr$$
$$= -q \int E \, dr$$
$$= -q \left[-k \frac{Q}{r} \right]$$
$$= qV$$

$$W = qV$$

Example :



$W_1 = q_1 V_1$ Muatan di titik A
$= 0$

$W_2 = q_2 V_2$ Muatan di titik B

$$V_2 = k \frac{q_1}{a}$$
$$W_2 = k q_2 \frac{q_1}{a}$$
$$= k \frac{q_1 q_2}{a}$$

$W_3 = q_3 \cdot V_3$ Muatan di titik C

$$V_3 = k \frac{q_1}{\sqrt{2}a} + k \frac{q_2}{a}$$
$$W_3 = k \left[\frac{q_1 q_3}{\sqrt{a}} + \frac{q_2 q_3}{a} \right]$$

$$W_4 = q_4 V_4$$

Mendapatkan $\sqrt{2}$ dari phytagoras $a^2 = \sqrt{a^2 + a^2}$
$a = a\sqrt{2}$

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

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

$$W_{tot} = W_1 + W_2 + W_3 + W_4$$

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

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

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

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

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

$W = \frac{1}{2}\int a V d\vec{l} \rightarrow$ Potensial oleh muatan pada garis

$W = \frac{1}{2}\int \sigma V d\vec{s} \rightarrow$ Potensial oleh muatan pada permukaan

$W = \frac{1}{2}\int \rho V d\tau \rightarrow$ Volume

$$\rho = \varepsilon_0 \nabla\cdot\vec{E} \rightsquigarrow \nabla\cdot\vec{E} = \frac{\rho}{\varepsilon_0}$$

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

Sehingga,

$$\boxed{W = \frac{\varepsilon_0}{2}\int (\nabla\cdot E)\, V\, d\tau}$$

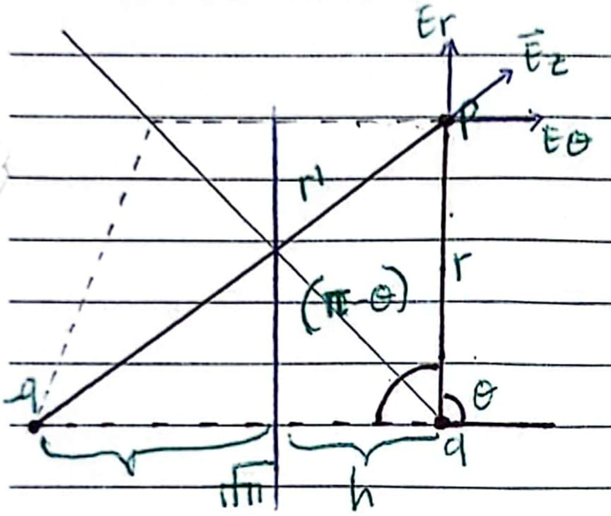
$$W = \frac{\varepsilon_0}{2}\int E^2\, d\tau$$

Hk. Gauss terjadi jika ada sumber muatan

BAB 3

METODA PENENTUAN POTENSIAL

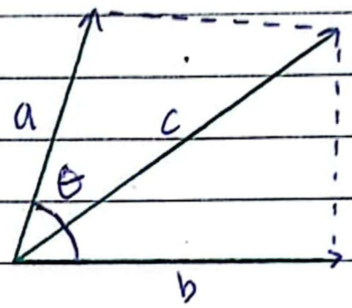
Metode Bayangan



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

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

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



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

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

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

$$\vec{E}_\theta = \frac{\partial V}{\partial \theta}$$

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

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

Yg tidak punya cos, maka tidak diturunkan