Nama : Dwi Wulandari

Npm : 2213022012

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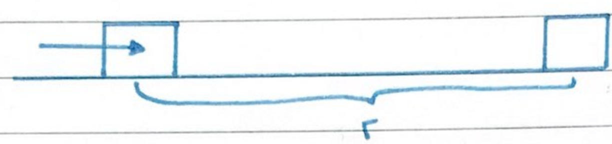
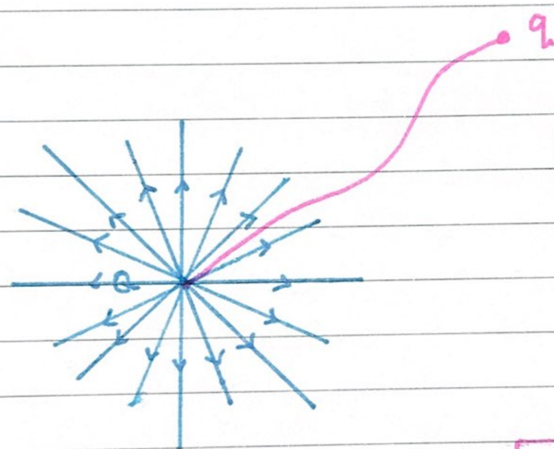
USAHA DAN ENERGI

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





$$W = \int F \, dr$$

$$= -q \int E \, dr$$

$$= -q \left[k \frac{Q}{r} \right] = q \cdot V$$

$$\boxed{W = q \cdot V}$$

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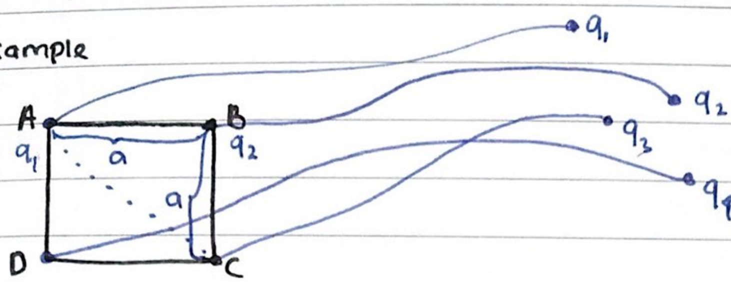
Example



Note !

Teorema Phytagoras

$a^2 = \sqrt{a^2+a^2}$

$a = a\sqrt{2}$

- $W_1 = q_1 . V_1$
  $= q_1 . 0$
  $= 0$

- $W_2 = q_2 . V_2$
  $V_2 = K \frac{q_1}{a}$
  $W_2 = K . q_2 \frac{q_1}{a}$
  $= K . \frac{q_1 . q_2}{a}$

- $W_3 = q_3 . V_3$
  $V_3 = K \frac{q_1}{\sqrt{2a}} + K \frac{q_2}{a}$

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

- $W_4 = q_4 V_4$
  $V_4 = K \left[\frac{q_1}{a} + \frac{q_2}{\sqrt{2a}} + \frac{q_3}{a} \right]$

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

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

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

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

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

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

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

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

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

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

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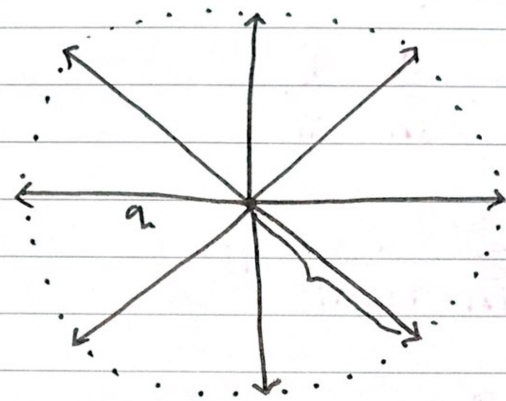
Persamaan Hukum Gauss

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



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

Sehingga melanjutkan persamaan sebelumnya maka

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

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

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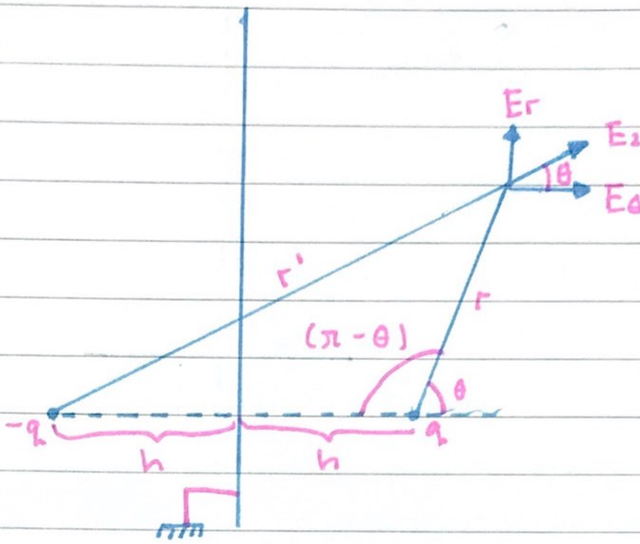
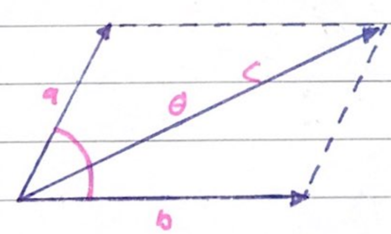
Bab 3 ! Metode Bayangan



$$V_p = K\left[\frac{q}{r} + \frac{-q}{r'}\right]$$

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

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



$$\vec{E_r} = -\frac{\partial v}{\partial r}$$

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

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

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

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

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

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