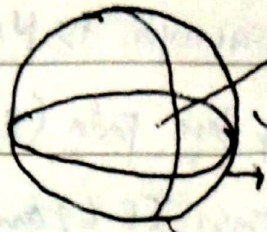
Kalisma No: Date: 1-09-2024

Potensial Listrik (elektrik potensial)

$W = G\frac{M\,m}{\rho}$



$V = G\frac{m}{\rho}$

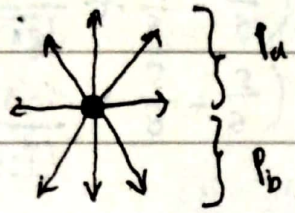
$V = \frac{W}{m}$

$\frac{W}{m} = G\frac{M}{\rho}$

$V = \frac{W}{q} \rightarrow \frac{F \cdot \rho}{q} \rightarrow \frac{k\,q \cdot Q \cdot \rho}{\rho^2} \rightarrow \frac{Q}{\rho}$

$V = k\frac{q}{\rho}$

$V = \frac{W_\infty}{q}$



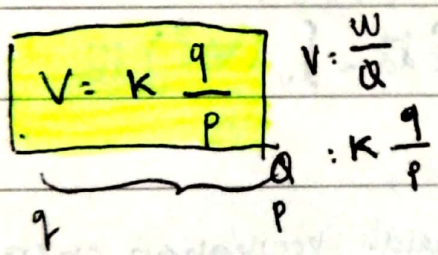
$\int_a^b dV = -\int \vec{E}\, d\rho$ $\int \Delta V$

$V|_a^b = -\int \frac{1}{4\pi\varepsilon_0}\frac{q}{\rho^2}\,d\rho$

$= -\frac{q}{4\pi\varepsilon_0}\int_a^b \frac{1}{\rho^2}\,d\rho$

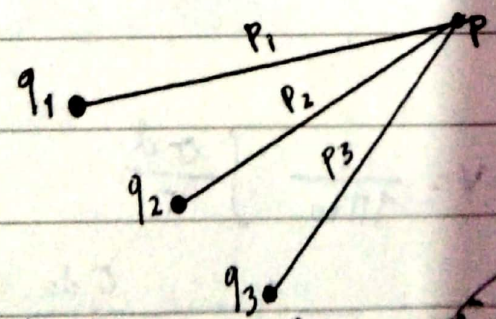
$= \frac{-q}{4\pi\varepsilon_0}\left(-\frac{1}{\rho}\right|_{r_a}^{r_b})$

$V_b - V_a = \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r_b} - \frac{1}{r_a}\right)$



$V = \frac{W}{Q}$

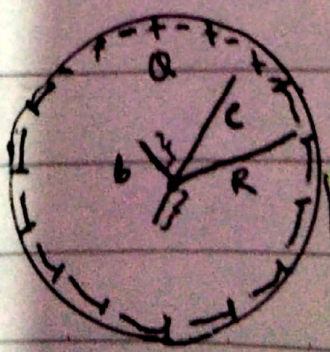
$= k\frac{q}{\rho}$



$V_P = k\left[\frac{q_1}{\rho_1} + \frac{q_2}{\rho_2} + \frac{q_3}{\rho_3}\right]$

$= k\sum_{i=1}^{n}\frac{q_i}{\rho_i}$

$V = \frac{W}{q} = \frac{F \cdot S}{q} = k\,\frac{q}{\rho}$



$V_b - V_a = \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r_b} - \frac{1}{r_a}\right)$

$V_b - V_a = k\frac{Q}{R}$

$V = k\frac{Q}{R}$ $\rho > R$

NOTEBOOK

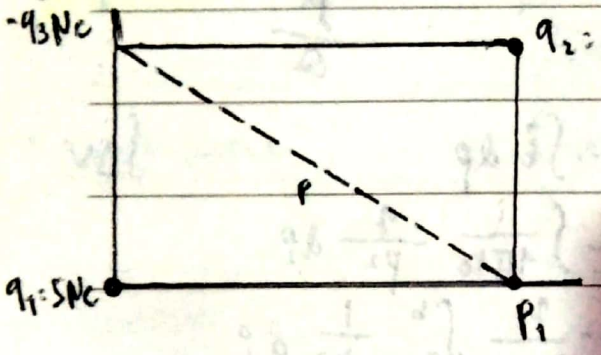
No: Date:

Soal 1

Dua buah muatan titik positif sama besarnya 5 μC pada sumbu x. Satu dipusat (0,0) dan yg lain pada (8,0) cm. Tentukan potensial di (a) titik P_1 pada posisi (8,6) cm

Jawab:

Gambarkan



$$V = \frac{kq_1}{r_1} = \frac{kq_2}{r_2} + \frac{k(-q_3)}{r_3}$$

$$= k\left(\frac{5}{8} - \frac{5}{8} + \frac{(-q)}{\sqrt{8^2+8^2}}\right)$$

$$= k\left(\frac{5}{8} + \frac{5}{8} + \frac{(-q)}{\sqrt{128}}\right)$$

→ Persamaan gaus $\oint_s \vec{E}\, d\vec{a} = \int_v (\nabla \cdot \vec{E})\, dv$

$\vec{E} = -\nabla V$

$\nabla \cdot E = -\nabla^2 V$

Potensial adalah perubahan energi

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

$\nabla^2 V = -\frac{\rho}{\varepsilon_0}$ Persen

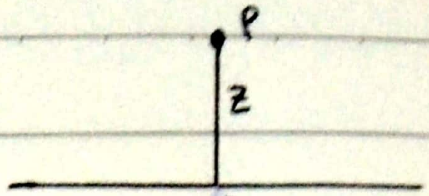
$\nabla^2 V = 0$ Laplace

$$V = \frac{1}{4\pi\varepsilon_0} \int \frac{\sigma\, d}{r}$$

$$= \frac{}{4\pi\varepsilon_0} \iint \frac{\sigma\, da}{(R^2+Z^2-2RZ\cos\theta)^{\frac{1}{2}}}$$

$$= \frac{\sigma}{4\pi\varepsilon_0} \int_0^{\pi} \int_0^{2\pi} \frac{r^2 \sin\theta\, d\theta\, d\phi}{(R^2+Z^2-2RZ\cos\theta)^{\frac{1}{2}}}$$

NOTEBOOK



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

$$\oint \vec{E}\, da = \frac{\lambda . L}{\varepsilon_0}$$

$$\vec{E}(2\pi\rho L) = \frac{\lambda L}{\varepsilon_0}$$

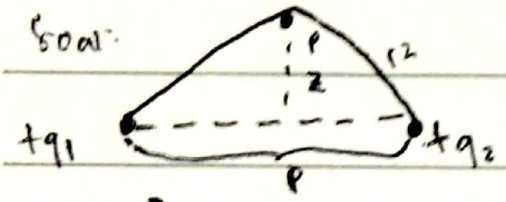
$$\vec{E} = \frac{\lambda}{2\pi\varepsilon_0 \rho}$$

$$V = -\int \vec{E}\, dr$$

$$= -\int \frac{\lambda}{2\pi\varepsilon_0} \frac{1}{\rho}\, dr$$

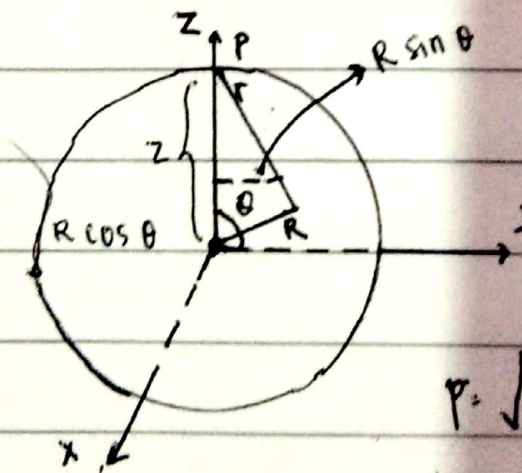
$$= -\frac{\lambda}{2\pi\varepsilon_0} \int \frac{1}{r}\, dr$$

Soal:



$V_p = ?$

$$V_p = ? \; k \left[\frac{q_1}{\sqrt{\left(\frac{1}{2}\rho\right)^2 + z^2}} + \frac{q_2}{\sqrt{\left(\frac{1}{2}\rho^2\right) + z^2}} \right.$$



$$V(p) = \frac{1}{4\pi\varepsilon_0} \int \frac{\sigma}{r}\, da$$

$$r^2 = R^2 + z^2 - 2Rz\cos\theta$$

$$\rho = \sqrt{(R\sin\theta)^2 + (z - R\cos\theta)^2}$$

$$r = \sqrt{R^2 + z^2 - 2R^2\cos\theta}$$

$$= \sqrt{R^2(\sin^2\theta + \cos\theta^2) + z^2 - 2zR\cos\theta}$$

$$= \sqrt{R^2 + z^2 - 2\,zR\cos\theta}$$