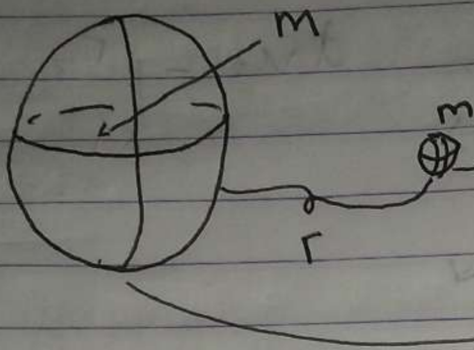
No. 01 - April - 2024
Date : Senin

Potensial Listrik

(~~[illegible]~~ analogi Potensial)



$W = G \frac{M \cdot m}{r}$

$V = G \frac{M}{r}$

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

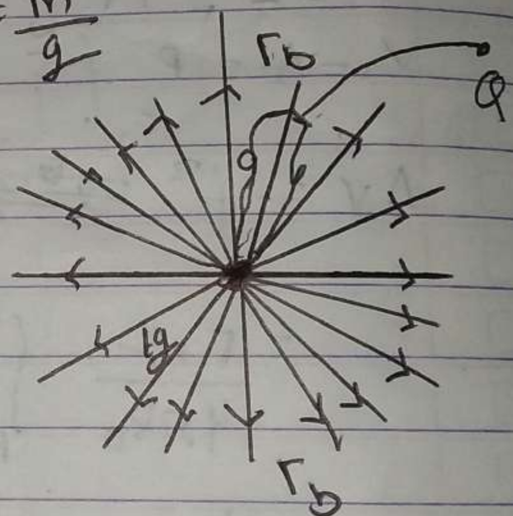
$V = \frac{W}{m} = G \frac{M}{r}$

$V = \frac{W}{q} = \frac{F \cdot r}{q}$

$= \frac{\frac{k^2 \cdot r}{r^2}}{Q}$

$$\boxed{V = k \frac{q}{r}}$$

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



$\int dV = -\int \vec{F}\, dr$

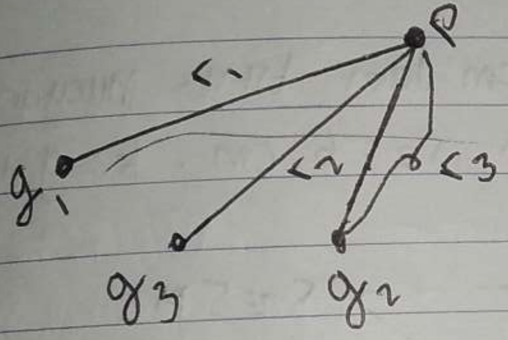
$V^a \Big|_a^b = \int \frac{1}{4\pi\varepsilon_0} \frac{q}{p^2}\, dr$

$= -\frac{q}{4\pi\varepsilon_0} \int_a^b \frac{1}{r^2}\, dr = \frac{q}{4\pi\varepsilon_0} \left(-\frac{1}{r} \Big|_a^b \right)$

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

$\int \Delta V$

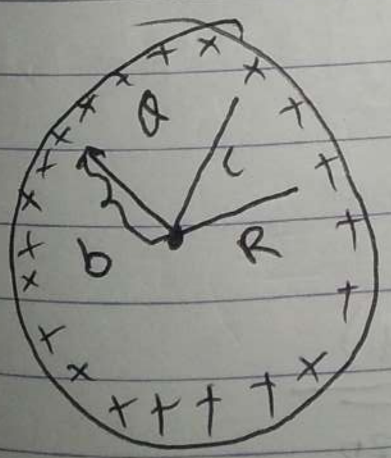
$$\boxed{V = k\frac{q}{r}} \qquad V = \frac{W}{Q} = k\frac{q}{r}$$



$$V = \frac{W}{q} = \frac{\vec{p}\cdot\vec{s}}{q} = k\frac{q}{r}$$

$$V_P = k\left[\frac{q_1}{r_1} + \frac{q_2}{r_2} + \frac{q_3}{r_3}\right]$$

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



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

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

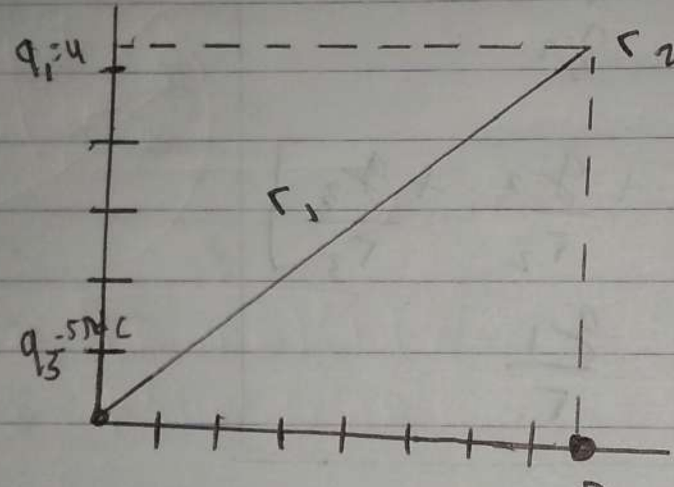
$$V = k\frac{Q}{r},\ r > R$$

Soal :

1 Gambarkan kasusnya Dua muatan titik positif sama besarnya $+5\ \mu C$ Pada sumbu x. Satu dipusat (0.0) dan yang lain pada (8.0) cm. tentukan Potensial di (a) titik P_1 pada posisi (8.6) cm.

Solusi:

titik P_1 berjarak 10 cm dari titik muatan pusat $q_1 = 5\ \mu C$. dan $r_1 = 10$ cm, $r_2 = 6$ cm. $k = 9 \cdot 10^6$ dyne $cm^2 / \mu C^2$.



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

$$= k\left(\frac{5}{9} - \frac{5}{9} + \frac{(-4)}{\sqrt{8^2+8^2}}\right.$$

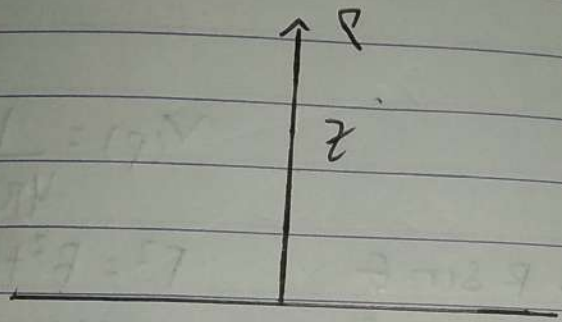
$$= k\left(\frac{5}{8} + \frac{5}{8} + \frac{(-4)}{\sqrt{120}}\right.$$

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

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

$$\nabla \vec{E} = \frac{\rho}{\epsilon_0}$$ Poison

$$\nabla^2 V = 0$$ laplance.



$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}$$

$$\oint \vec{E} \cdot da = \frac{\lambda . L}{\epsilon_0}$$

$$\vec{E}(2\pi r l) = \frac{\lambda . l}{\epsilon_0}$$

$$\boxed{\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}}$$

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

$$= -\int \frac{\lambda}{2\pi\epsilon_0} \frac{1}{r}\, dr$$

$$= \frac{-\lambda}{2\pi\epsilon_0} \int \frac{1}{\rho}\, dr$$

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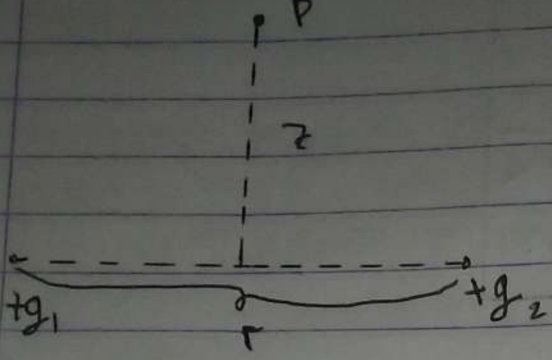
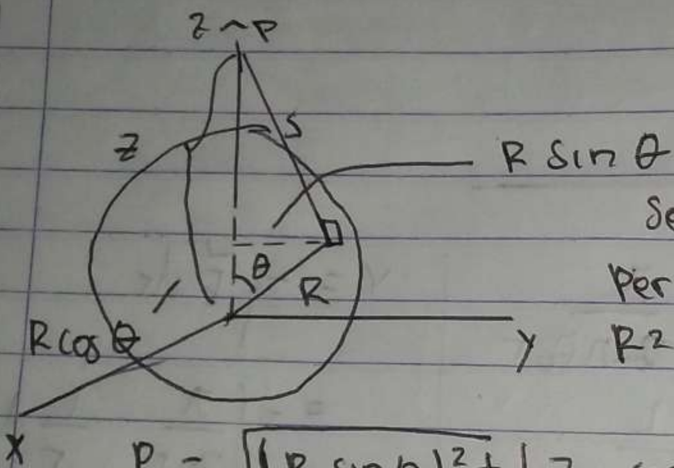
$V_P = ?$



$$V_P = k\left[\frac{q_1}{\sqrt{(+P)^2+z^2}} + \frac{q_2}{\sqrt{(-P)^2+z^2}}\right]$$



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

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

Sebuah elemen luas permukaan pada bidang ini $R^2 \sin\theta \, d\theta \, d\phi$, jadi

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

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

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

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

$$V = \frac{1}{4\pi\varepsilon_0}\int \frac{\sigma}{P}\, da$$

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

$$= \frac{\sigma}{4\pi\epsilon_0} \int_0^{\pi}\int_0^{\pi} \frac{R \sin\theta \, d\theta \, d\phi}{(R^2+z^2-2Rz\cos\theta)^{\frac{1}{2}}}$$

$$= \frac{\sigma R 2\pi}{4\pi\epsilon_0} \int_0^{\pi} \frac{\sin\theta \, d\theta}{(R^2+z^2-2Rz(\cos\theta))^{\frac{1}{2}}}$$

$$V_P = \square \int_0^{\pi} \frac{d(\cos\theta)}{(R^2+z^2-2Rz(\cos\theta))^{\frac{1}{2}}}$$

$$= \square \int_0^{\pi} (R^2+z^2-2Rz\cos\theta)^{-\frac{1}{2}} d(\cos\theta)$$

$$= \square 2 \int (R^2+z^2-2Rz\cos\theta)^{\frac{1}{2}} \Big|_0^{\pi}$$