No
Date 1 April 2024

POTENSIAL LISTRIK
(Electric Potential)

$$W = G\frac{Mm}{r}$$

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

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

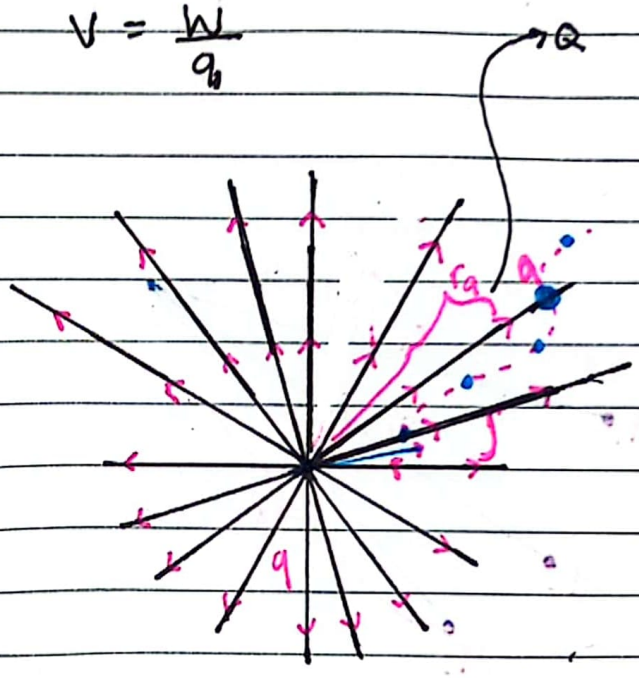
$$V = \frac{W}{M} = G\frac{m}{r}$$

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

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

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

$$V = \frac{W}{q_0}$$



$$\int dV = -\int \vec{E} \cdot dr$$

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

$$= -\frac{q}{4\pi\varepsilon_0}\int_{r_a}^{r_b}\frac{1}{r^2}\,dr =$$

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

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

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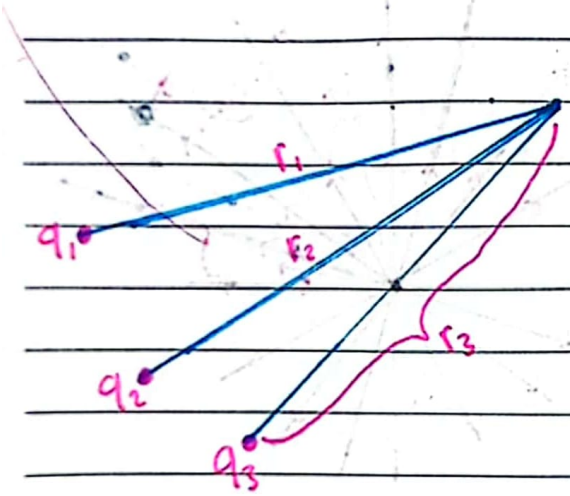
Bagian Q

$\int \Delta V \quad k \frac{qQ}{r}$

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

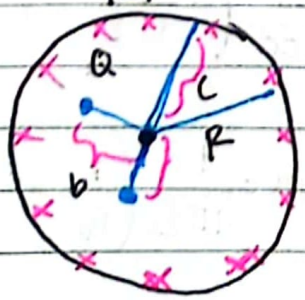
$q \qquad P = k \frac{q}{r}$



$V = \frac{W}{q} = \frac{\vec{P} \cdot \vec{S}}{q} = k \frac{q}{r}$

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

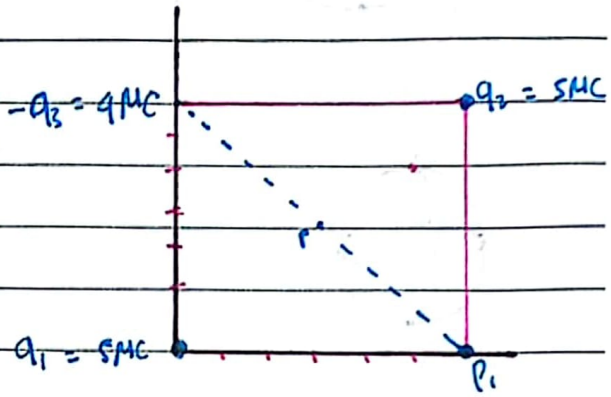
$= k \sum_{i=1}^{n} \frac{q_i}{r_i}$



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

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

Soal



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

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

$= k \left(\frac{5}{8} + \frac{5}{8} + \frac{(-4)}{\sqrt{128}} \right)$

Persamaan Poisson dan Persamaan Lapalace

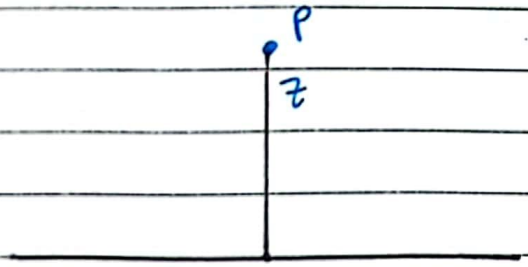
$E = -\nabla V$

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

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

$\nabla^2 V = \frac{\rho}{\epsilon_0}$ → Poisson

$\nabla^2 V = 0$ → Lapalace



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

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

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

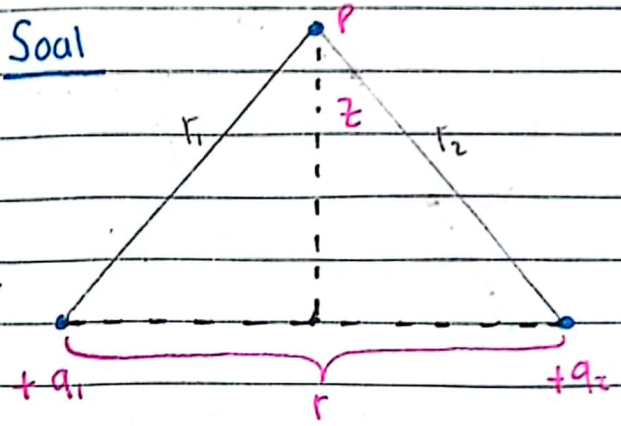
$$\boxed{\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}}$$

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

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

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

Soal



$V_p = \ldots . ?$

Jawab:

$$V_p = k \left[\frac{q_1}{\sqrt{(\frac{1}{2}r)^2 + z^2}} + \frac{q_2}{\sqrt{(\frac{1}{2}r)^2 + z^2}} \right]$$

Note:
Hk. Gauss $\oint \vec{E} . d\vec{a} = \int (\nabla . \vec{E}) d\tau$

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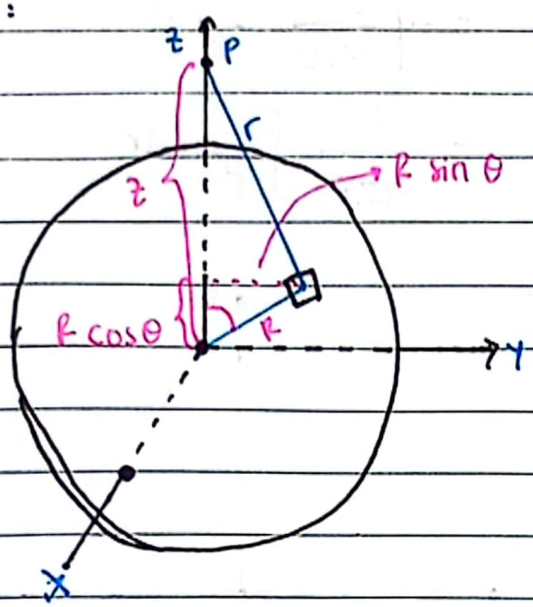
Potensial Muatan terdistribusi Lokal

Soal :



Jawab:

$$V(P) = \frac{1}{4\pi\epsilon_0}\int \frac{\sigma}{r}\,da$$

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

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

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

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

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

$$V = \frac{1}{4\pi\epsilon_0}\int \frac{\sigma\,da}{r}$$

$$V = \frac{1}{4\pi\epsilon_0}\int \frac{\sigma\,da}{(R^2 + z^2 - 2Rz\cos\theta)^{\frac{1}{2}}}$$

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

R^2

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

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

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