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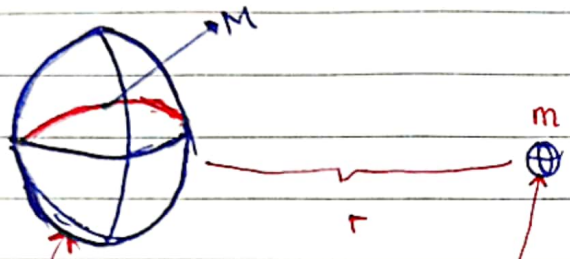
Kalisma

Diskrit } ufs
Kontinu }

Potensial Listrik (Elektro potensial)



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

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

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

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

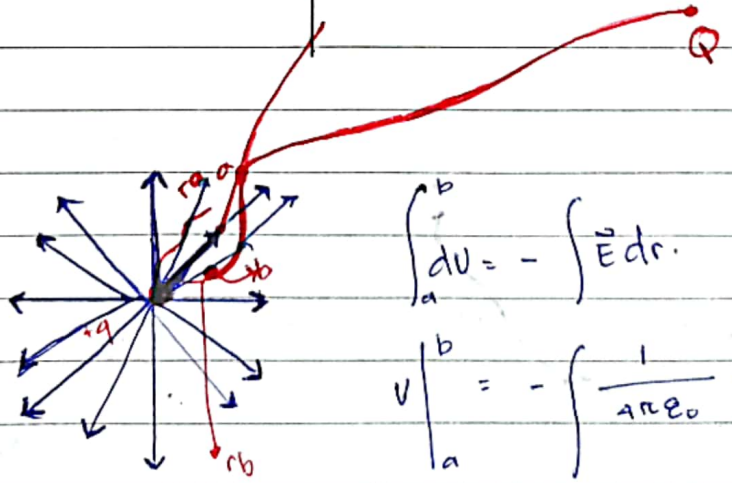
$= \frac{f \cdot r}{q}$

$= \frac{K\frac{q_1 q_2}{r}}{Q}$

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

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

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



$\int_a^b dU = -\int \vec{E}\, dr.$

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

$= -\frac{}{}$

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

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

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

Kasus.

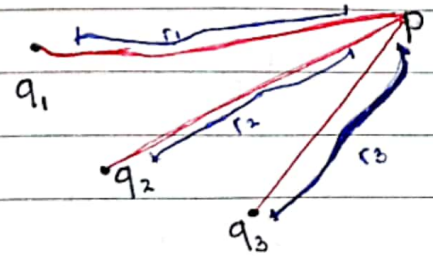
$$V = k\frac{q}{r}$$

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

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

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

ex.



$$V = \frac{W}{q} = \frac{\vec{F}_1 \cdot \vec{S}}{q} = k\frac{q}{r}$$

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

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

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potensial?

potensialnya sama semua. $k\frac{Q}{R}$.

Potensial diluar??

$$V_b - V_a = \frac{q^{=0}}{4\pi\varepsilon_0}\left(\frac{1}{r_b} - \frac{1}{r_a}\right)$$

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

potensial diluar

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

$$V = \frac{kq_1}{r_1} + \frac{kq_2}{r_2} + \frac{kq_3}{r_3}$$

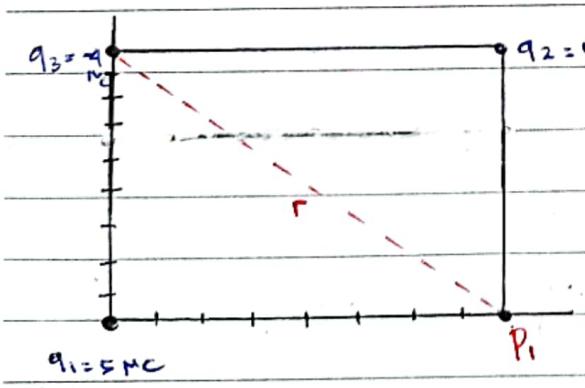
$$V = k\left(\frac{5}{8} + \frac{5}{8} + \frac{(-4)}{\sqrt{8^2+8^2}}\right)$$

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

PERSAMAAN POISSON dan PERSAMAAN LAPALACE

Soal!

1. Dua muatan titik positif sama besarnya +5 MC pda sumbu x. satu dipusat (0,0) dan yg lain pda (8,0) cm. Tentukan potensial di (a) titik P_1 pda posisi (8,6) cm.



1. poisson.

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

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

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

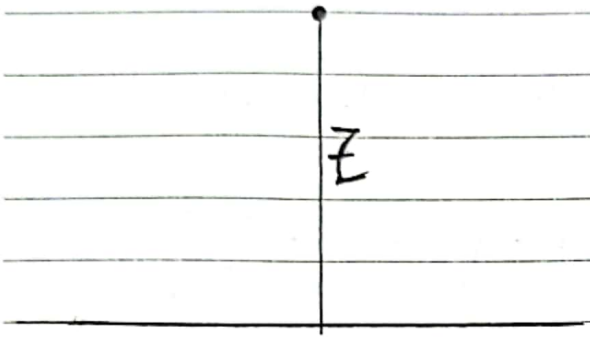
$$\nabla^2 V = \frac{\rho}{\varepsilon_0}$$

$\nabla^2 V = 0$ tdk ada sumber

note: $\oint_s \vec{E}\,da = \oint_V (\nabla \cdot \vec{E})\,dv$ (Gauss).

$\nabla^2 V = 0$ Laplace (potensial)

Gradien : Perubahan (dlm fisika)



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

$$\oint \vec{E}\, da = \frac{\lambda \cdot l}{\varepsilon_0}$$

$$\vec{E}(2\pi r l) = \frac{\lambda \cdot l}{\varepsilon_0}$$

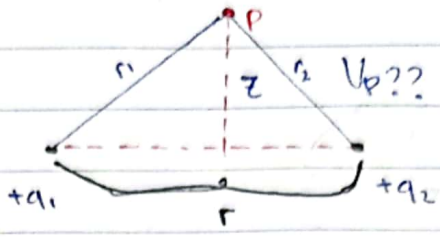
$$\vec{E} = \frac{\lambda}{2\pi\varepsilon_0 r}$$

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

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

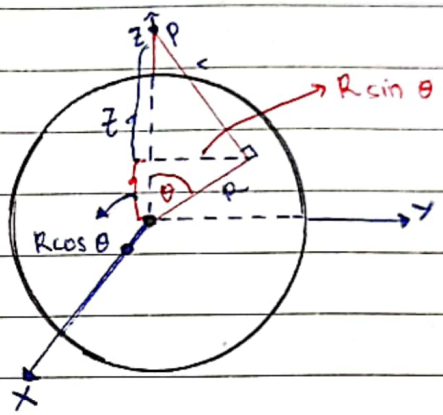
$$= -\frac{\lambda}{2\pi\varepsilon_0}\int \frac{1}{r}\, dr$$

1.



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

2.



$$V_p = \frac{1}{4\pi\varepsilon_0}\int \frac{\sigma}{r}\, da$$

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

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

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

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

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Kalkulus

Lanjutan

dq = σda

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

$da = R^2 \sin\theta\, d\theta\, d\varphi$

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

$r^2 = R^2$

$$= \frac{\sigma}{4\pi\varepsilon_0}\int_0^{\pi}\int_0^{2\pi} \frac{r^2 \sin\theta\, d\theta\, d\varphi}{(R^2+z^2-2zR\cos\theta)^{1/2}}$$

$$= \frac{\sigma R 2\pi}{4\pi\varepsilon_0}\int_0^{\pi} \frac{\sin\theta\, d\theta}{(R^2+z^2-2Rz\cos\theta}$$

$$V_p = \frac{\sigma R 2\pi}{4\pi\varepsilon_0}\int_0^{\pi} \frac{d(\cos\theta)}{(R^2+z^2-2Rz\cos\theta)^{1/2}}$$

$$= \frac{\sigma R 2\pi}{4\pi\varepsilon_0}\int_0^{\pi} (R^2+z^2-2Rz\cos\theta)^{-1/2}\, d(\cos\theta)$$

$\left(\frac{1}{-1/2+1} = 2\right) = (2)$

$$= \frac{\sigma R 2\pi}{4\pi\varepsilon_0}\, 2\,(R^2+z^2-2Rz\cos\theta)^{1/2}\Big|_0^{\pi}$$