Senin, 1 April 2024

Potensial Listrik
(Electrik Potensial)

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

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

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

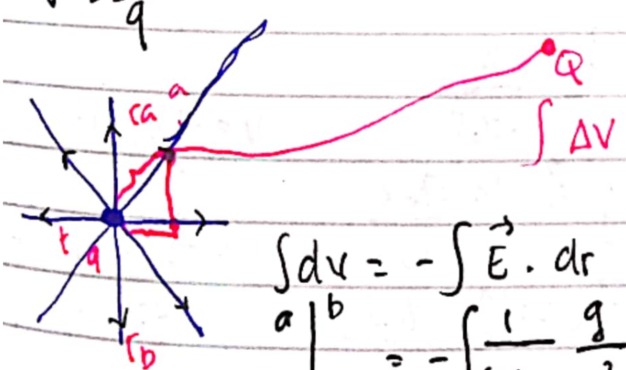
$$V = \frac{W}{M} = G\frac{M}{r}$$

$$\cancel{\frac{W}{q}}$$

$$V = \frac{W}{q} = \frac{F.r}{q} = \frac{k\frac{qQr}{r^2}}{Q}$$

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

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



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

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

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

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

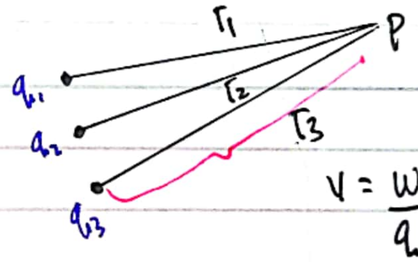
$$= \boxed{V_b - V_a = \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r_b} - \frac{1}{r_a}\right)}$$

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

q

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

$$V = \frac{W}{Q} \rightarrow k\frac{qQ}{r}$$



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

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

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

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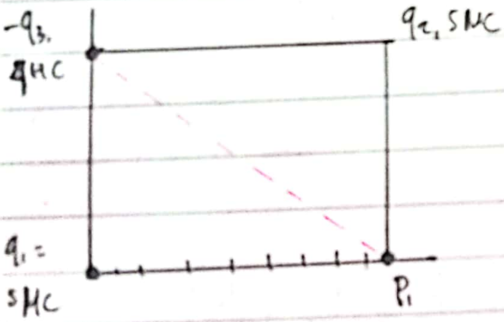
$$V_b - V_a = \frac{q}{4\pi\epsilon_0}\left(\frac{1}{r_b} - \frac{1}{r_c}\right) = 0$$

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

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



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

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

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

Persamaan Poisson dan Persamaan Lapalace

$$E = -\nabla V$$

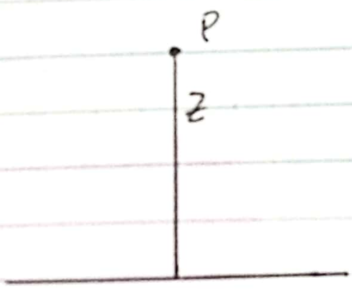
$$\nabla \cdot E = -\nabla^2 V$$

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

$$\nabla^2 V = -\frac{\rho}{\epsilon_0} \Rightarrow \text{Poisson}$$

$$\nabla^2 V = 0 \Rightarrow \text{Lapalace}$$

$$\oint_s \vec{E} \cdot d\vec{a} = \int_v (\nabla \cdot \vec{E})\, d\bar{b}$$



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

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

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

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

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

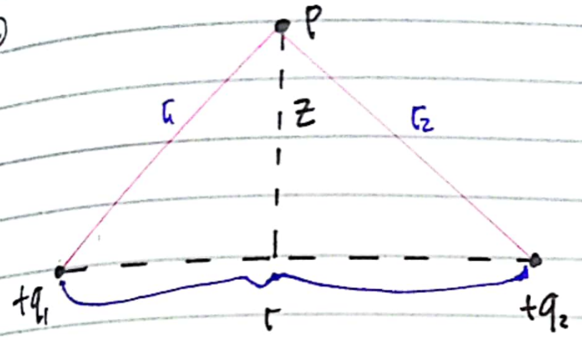
$$= -\int \frac{\lambda}{2\pi\epsilon_0}\frac{1}{r}\, dr$$

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

Exam
(1.)
+
(2.)
x

Example :

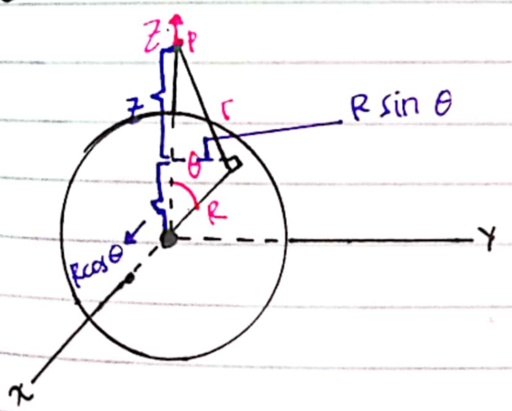
①



$V_p = \dots ?$

$$K = \left[\frac{q_1}{\sqrt{(tr)^2 + z^2}} + \frac{q_{12}}{\sqrt{(tr)^2 + z^2}} \right]$$

②



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

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

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

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

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

dengan $= \sigma da$

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

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

R^2

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

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

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

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

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

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