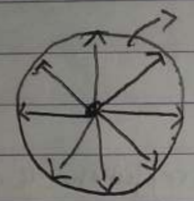
Catatan

No. 25 - Maret - 2024

Date : Senin

# Hukum Gauss dan appluid

$$\oint_S \vec{E} \cdot d\vec{A} = \int_V (\nabla \cdot \vec{E})\, dE$$



$$\oint \vec{E} \cdot dA = \oint \frac{g}{4\pi KQ} r^2 \sin\theta\, dt\, d\phi$$

$$= \frac{g}{4\pi KQ} \int_0^{\pi} \int_0^{2\pi} \sin\theta\, d\theta\, d\phi$$

$$= \frac{4\pi g}{4\pi KQ}$$

$$\oint_S \vec{E} \cdot dA = \frac{g}{KQ}$$ → Persamaan Gaus dalam bentuk Integral

$$\int_V (\nabla \cdot \vec{E})\, d\tau$$

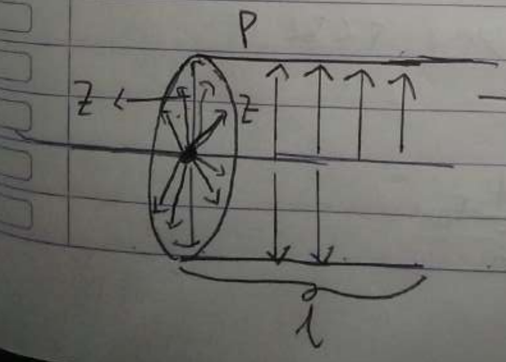
$$Q = \int P\, d\tau$$

$$\oint \vec{E} \cdot d\vec{A} = (\nabla \cdot E)\, d\tau$$

$$\int_V (\nabla \cdot \vec{E})\, d\tau = \left(\frac{Q}{E_0}\right) \to P\, d\tau$$

$$= \frac{1}{E_0} \int P\, d\tau$$

$$\boxed{\nabla \cdot E = \frac{1}{E_0} P}$$ → Persamaan Gaus dalam bentuk diferensial




→ $E = v$

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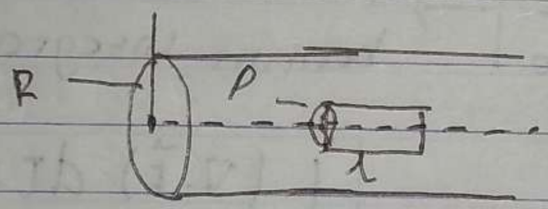
$$\oint \vec{E}\cdot dA = \frac{q}{\varepsilon_0}$$

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

$$\vec{E} = \frac{\lambda}{2\pi\varepsilon_0 z}\hat{z}_0$$

Solusi:

Langkah 1: Menampilkan atau menggambarkan Model diketahui




$$\oint \vec{E}\cdot dA = \frac{q}{\varepsilon_0}$$

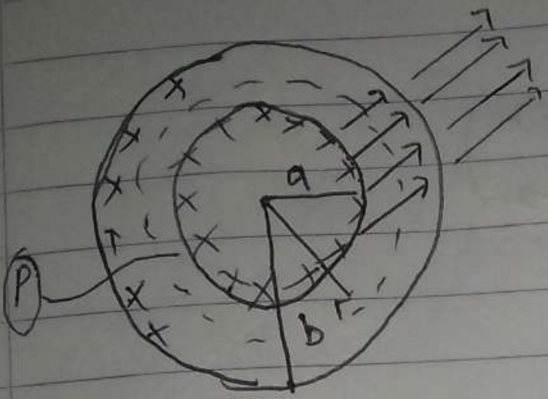
$$\vec{E}(2\pi r\cdot l) = \frac{q}{\varepsilon_0}$$

$$\vec{E} = \frac{Q}{2\pi\varepsilon_0 r_1}\vec{r}$$ , dimana $r < R$

Pada $r = R$,

maka $E(2\pi R l) = \frac{q}{\varepsilon_0} r_0$.

Sehingga $\vec{E} = \frac{q}{2\pi\varepsilon_0 R l}\hat{r}_0$




Medan listrik.

1). ~~[illegible]~~ $r < a$

2). ~~[illegible]~~ $a < r < b$

3) ~~[illegible]~~ $r > b$

$\vec{E} = 0$

$\oint \vec{E} \cdot dA = \frac{Q}{\varepsilon_0}$

$\oint \vec{E} \cdot dA$

$$\vec{E} \cdot (4\pi r^2) = \frac{1}{\varepsilon_0}\iiint \rho \, d\tau$$

$$= \frac{1}{\varepsilon_0}\int^{a}\int^{2\pi}\int^{\pi} \rho \cdot r^2 \sin\theta \, dr \, d\phi \, d\theta$$

$$= \frac{4\pi\rho}{\varepsilon_0}\int_0^a r^2 \, dr$$

$$= \frac{4\pi\rho}{\varepsilon_0}\left(\frac{1}{3} r^3 \Big|_0^a\right)$$

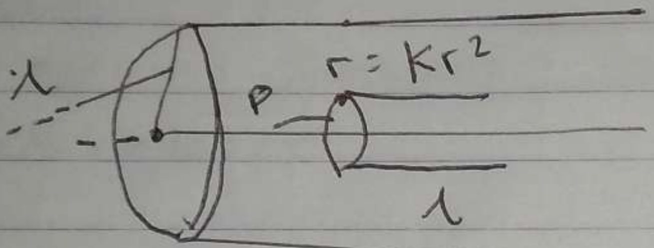
$r > b$

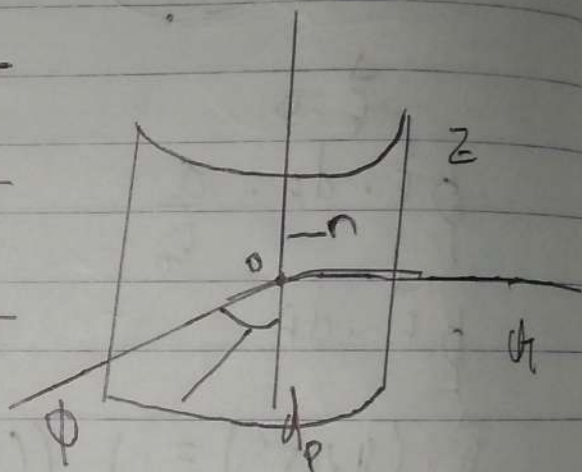
$$\oint \vec{E} \cdot dA = \frac{1}{\varepsilon_0}\iiint \rho \, d\tau$$

$$= \frac{1}{\epsilon_0}\iiint r \;\; \epsilon^2 \sin\theta \, d\theta \, dr \, d\phi$$

$$= \frac{4\pi r}{\epsilon_0}\int_a^b r^2 dr$$

$$= \frac{4\pi r}{\epsilon_0}\left(\frac{1}{3} r^3 \Big|_a^b\right)$$




1). $P < R$

2). $P > R$

$$\oint \vec{E} \cdot dA = \frac{1}{\epsilon_0}\iiint \rho \, d\tau$$

$$\vec{E}\,(2\pi r \cdot l) = \frac{1}{\epsilon_0}\iiint (k\rho)^2 \rho^2 \sin\theta \, d\theta \, d\phi \, d\tau$$

$$= \frac{k\,(\nu r)}{\epsilon_0}\int_0^a \rho^4 \, d\tau$$

$W = F \cdot S$

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

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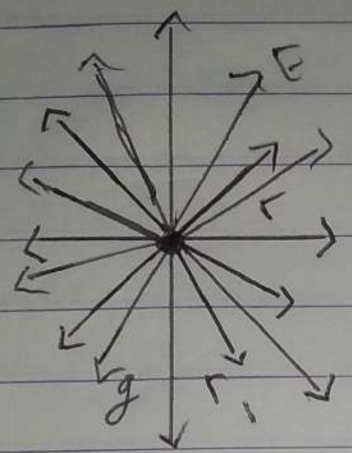
$$V = \frac{\partial}{r}$$




$$dV = -\int_{r_1}^{r_2} \vec{E}\, dP$$

$$= - \int P_1$$

$$V_1 - V_2 = P \int_{r_1} \vec{E}$$

$$\Delta V = -\int^{r_2} \cancel{\frac{Q_1 \cdot g}{}} \frac{g}{4\pi\varepsilon_0 r^2}\, dr$$

$$= \frac{r_1 g}{4\pi\varepsilon_0} \int_{P_1}^{P_2} \rho^{-2}\, dr$$

$$\Delta V \neq dV$$

$$= -\square \int^{r_2} dP$$

$$= -\square \left( -\frac{1}{P} \Big|_{P_1}^{P_2} \right) = \square \left( \frac{1}{r^2} - \frac{1}{r^1} \right)$$