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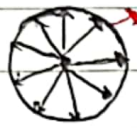
KALISMA

Hukum Gauss and applied

$$\oint_S \vec{E} \cdot d\vec{a} = \oint (\nabla \cdot \vec{E})\, dV$$



G => V

$$\oint \vec{E}\, d\vec{a} = \oint \frac{q}{4\pi\varepsilon_0 r^2} r^2 \sin\theta \, d\theta d\phi$$

$$= \frac{q}{4\pi\varepsilon_0} \int_0^{\pi} \int_0^{2\pi} \sin\theta \, d\theta d\phi \quad \text{integral (2)} \rightarrow 4\pi$$

$$= \frac{4\pi q}{4\pi\varepsilon_0}$$

$$\boxed{\oint_S \vec{E}\, d\vec{a} = \frac{q}{\varepsilon_0}} \Rightarrow \text{persamaan Gauss dalam bentuk diferensial}$$

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

$Q = \rho\, dG$ $\qquad \oint \vec{E} \cdot d\vec{a} = \int (\nabla E)\, dG$

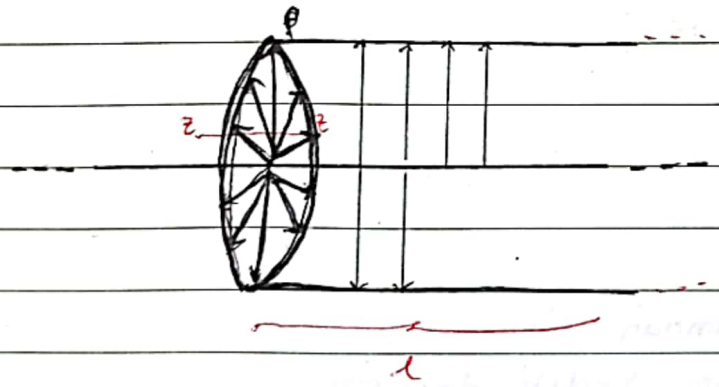
$$\int_V (\nabla \cdot \vec{E})\, dG = \boxed{\frac{Q}{\varepsilon_0}} \rightsquigarrow \rho\, dG$$

$$= \frac{1}{\varepsilon_0} \int \rho\, dE$$

→ Hk. Gauss

$$\boxed{(\nabla \cdot \vec{E} = \frac{\rho}{\varepsilon_0}} \rightsquigarrow \text{dim bentuk diferensial}$$

ex.



$$\oint \vec{E}\, da = \frac{q}{\varepsilon_0}$$

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

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

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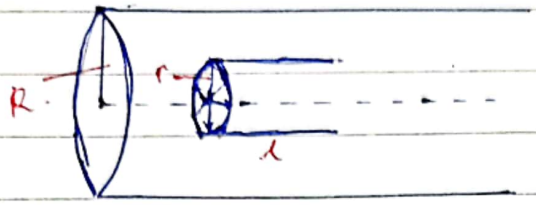
contoh soal!

Kalisma

1.

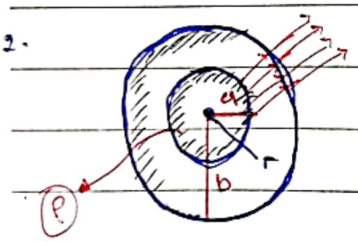


2. $\oint \vec{E}\, da = \frac{Q}{\varepsilon_0}$

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

$\vec{E} = \frac{Q}{2\pi\varepsilon_0 r l}\hat{r}_0$

2.



calculate : of $\vec{E}$

a. $r<a$

b. $a<r<b$

c. $r>b$.

a). $\vec{E} = 0$

b). $\oint \vec{E}\cdot da = \frac{Q}{\varepsilon_0}$

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

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

$= \frac{1}{\varepsilon_0}\int_0^a\int_0^{2\pi}\int_0^{\pi} \rho\, r^2 \sin\theta\, d\theta\, d\phi\, dr$

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

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

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(3.) b c). $r > b$.

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

$$= \frac{1}{\varepsilon_0} \int_a^b \int_0^{2\pi} \int_0^{\pi} \rho r^2 \sin\theta\, d\theta\, d\phi\, dr.$$

$$= \frac{4\pi\rho}{\varepsilon_0} \int_a^b r^2\, dr.$$

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

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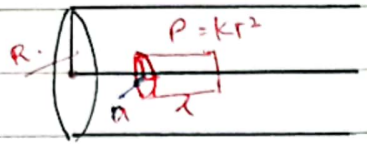
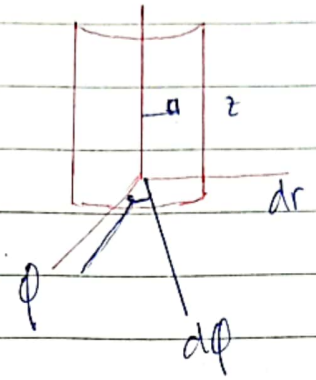
Kalisma.



note: $\int dx$

$\int \Phi dx$

$= x$.



1. $r < R$
2. $r > R$.

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

$\vec{E}(2\pi r \cdot \ell) = \frac{1}{\varepsilon_0} \int_0^{2\pi} \int_0^{\ell} \int_0^{R} (kr^2)\, r \; d\phi\, dz\, dr$

$= \frac{2\pi k}{\varepsilon_0} \int_0^{\ell} dz \int_0^{R} r^3\, dr.$

② $\oint \vec{E}\, da = \frac{Q}{\varepsilon_0}$

$\vec{E}(2\pi r \cdot \ell) = \frac{1}{\varepsilon_0} \int_0^{R\pi} \int_0^{} (\;$

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Potensial.

oleh muatan listrik

Karau beda potensial oleh arus listrik.

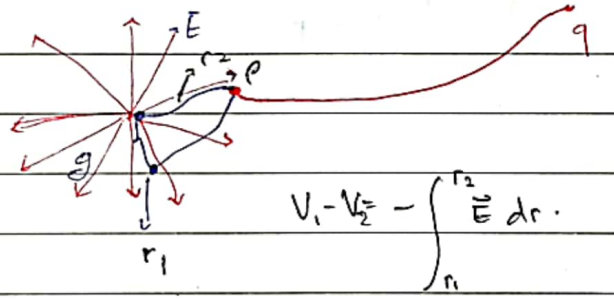
potencial listrik

usaha memindahkan muatan dari

$W = F \cdot s$

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

$V = k \frac{q}{r}$. $V = -\int \vec{E}\, dr$.



$V_1 - V_2 = -\int_{r_1}^{r_2} \vec{E}\, dr$.

$\Delta V = -\int_{r_1}^{r_2} \frac{Q}{4\pi\varepsilon_0 r^2} dr$

$\boxed{\Delta V \neq dV}$.

$= \square \int_{r_1}^{r_2} r^2\, dr$ $= \frac{r \cdot q}{4\pi\varepsilon_0} \int_{r_1}^{r_2} r^{-2} dr$.

$= \square \left(-\frac{1}{r} \Big|_{r_1}^{r^2} \right)$

$= \square \left(\frac{1}{r_2} - \frac{1}{r_1} \right)$

$\boxed{V = \frac{1}{4\pi\varepsilon_0} \frac{q}{r} = k \frac{q}{r}}$