Senin, 25 Maret 2024.

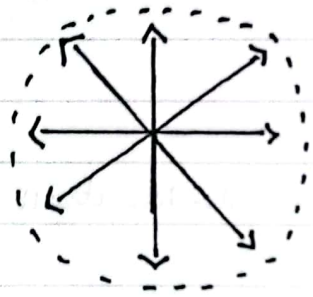
Nama: puput · Rahayu

Kelistrikan dan Kemagnetan.

Hukum Gauss

$\Delta v \neq dv$

$\oint_s \vec{E}\ \vec{da} = \int_v (\nabla . \vec{E}|\ dG$



$\oint \vec{E}\ d\vec{a} = \oint \frac{q}{4\pi\varepsilon_0 r^2} \not{r^2} \sin\theta\, d\theta\, d\phi$

$= \frac{q}{4\pi\varepsilon_0} \int_0^{\pi} \int_0^{2\pi} \sin\theta\, d\theta\, d\phi$

$= \frac{q(2\pi)}{4\pi\varepsilon_0} \int_0^{\pi} \sin\theta\, d\theta$

$\oint \vec{E}\, dq = \frac{4\pi q}{4\pi\varepsilon_0}$

$\oint \vec{E} dq = \frac{q}{\varepsilon_0}$

$\int_v (\nabla . \vec{E})\, d\,G$

Q not : $\rho\ dG$

: $\sigma\ dq$

: $\lambda\ d\ell$

$\iiint \nabla . E\ dG = \iiint \rho . \frac{dG}{\varepsilon_0}$

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

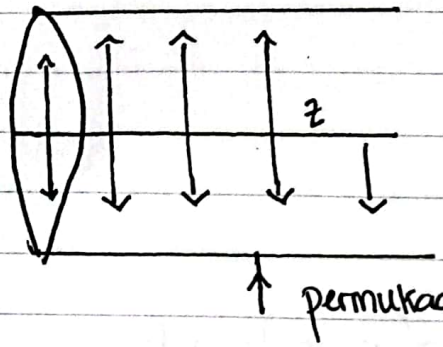
Differensial (Turunan)

↳ kecepatan, percepatan.

No.

Date

contoh:



Gauss

Fluks yang muncul pada daerah tertentu karena ada muatan

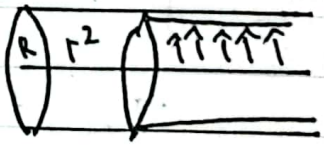
$\oint \vec{E} \cdot da = \frac{q}{\varepsilon_0}$ $\quad \frac{\lambda \cdot \ell}{}$

$\vec{E}(2\pi\rho \cdot \ell) = \frac{\lambda \ell}{\varepsilon_0}$

$\oint \vec{E} \cdot dq = \frac{\lambda \ell}{\varepsilon_0}$

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

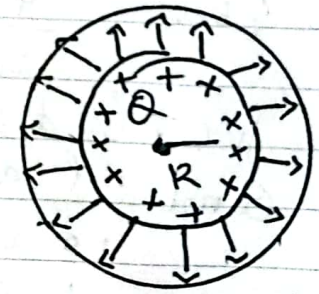
$\oint \vec{E} \cdot d\vec{q} = \frac{q}{\varepsilon_0} \rightsquigarrow$



Hitung $\vec{E}$ pada

a. $r < R$

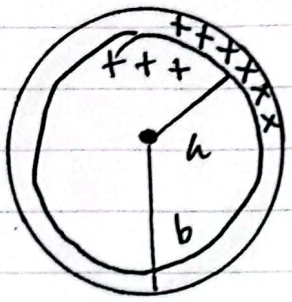
b. $r > R$



↳ permukaan Gauss

$\oint_S \vec{E} \cdot da = \frac{Q\,inc}{\varepsilon_0}$

$\vec{E}(4\pi r^2) = \frac{Q\,inc}{\varepsilon}$



$r < a \rightarrow \vec{E} = 0$

$a < r < b$

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

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

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

$\int_0^{\pi} \int_0^{2\pi} \sin\theta \, d\theta \, d\phi$

$= 4\pi$

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

$* \vec{E}(4\pi r^2) = \frac{4\pi}{\varepsilon_0} \int_0^1 r^2 \, dr$

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

$\vec{E}(4\pi r^2) = \frac{4}{3} \frac{\pi r^3}{\varepsilon_0} = \vec{E} \cdot \frac{\rho a^3}{3\varepsilon_0 r^2} \hat{r}$

$\vec{E} \cdot (4\pi r^2) \cdot \frac{1}{\varepsilon_0} \int_a^b \int_0^{2\pi} \int_0^{\pi} \rho \sin\theta \, d\theta \, d\phi \, dr$

$\vec{E} \cdot (4\pi r^2) = \frac{\rho}{\varepsilon_0} 4\pi \int_a^b r^2 \, dr$

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

$= \frac{\rho \cdot 4\pi}{3\varepsilon_0} (b^3 - a^3)$

$E = \frac{\rho}{3\varepsilon_0 r^2} (b^3 - a^3)$