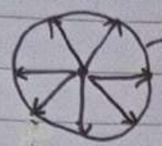
No. Senin

Date 25 maret 24.

Hukum Gauss and applied.

$$\oint_S \vec{E} \cdot d\vec{a} = \int_V (\nabla \cdot \vec{E})\, dG.$$

$G = V$



surface of Gauss

$$\oint \vec{E} \cdot da = \oint \frac{q}{4\pi\epsilon_0 r^2} r^2 \sin\theta\, d\theta\, d\phi$$

$$= \frac{q}{4\pi\epsilon_0} \int_0^{\pi}\int_0^{2\pi} \sin\theta\, d\theta\, d\phi$$

$$= \frac{\cancel{4\pi} q}{\cancel{4\pi}\epsilon_0}$$

$$\boxed{\oint_S \vec{E} \cdot da = \frac{q}{\epsilon_0}}$$ → Persamaan Gauss dalam bentuk differensial

$$\int_V (\nabla \cdot \vec{E})\, d\tau_0$$

$Q = \rho\, d\tau_0$

$$\oint_S \vec{E} = d\vec{a} = \int_V (\nabla \cdot E) \cdot d\tau_0$$

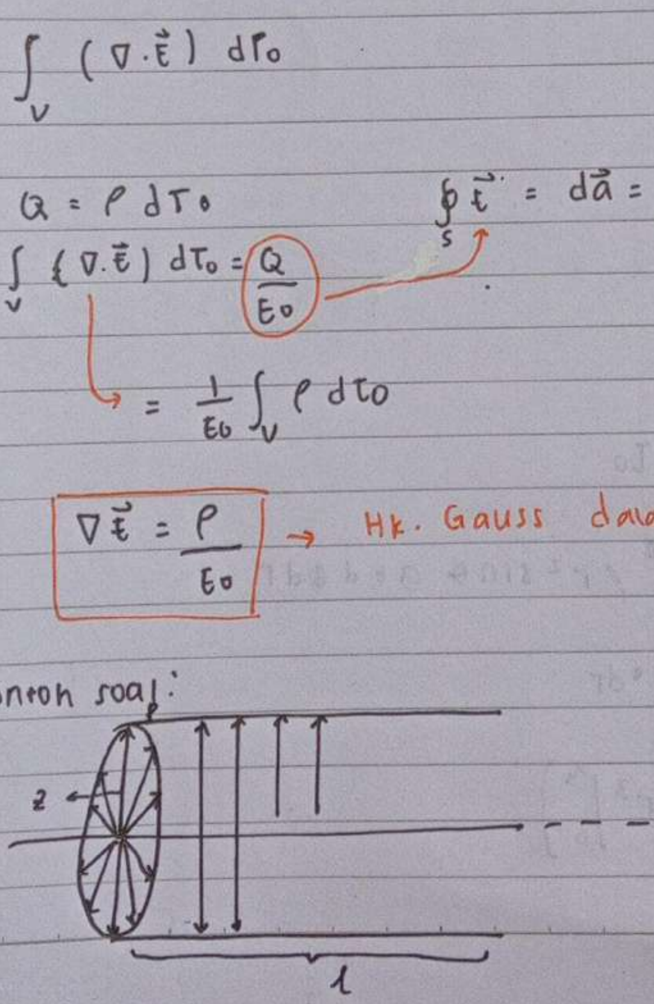
$$\int_V (\nabla \cdot \vec{E})\, d\tau_0 = \frac{Q}{\epsilon_0}$$

$$= \frac{1}{\epsilon_0}\int_V \rho\, d\tau_0$$

$$\boxed{\nabla \vec{E} = \frac{\rho}{\epsilon_0}}$$ → Hk. Gauss dalam bentuk differensial.

contoh soal:

1.



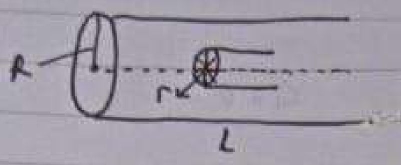
$$\oint \vec{E} \cdot da = \frac{q}{\epsilon_0}$$

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

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 z} \hat{z}_0$$

contoh soal:

1.



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

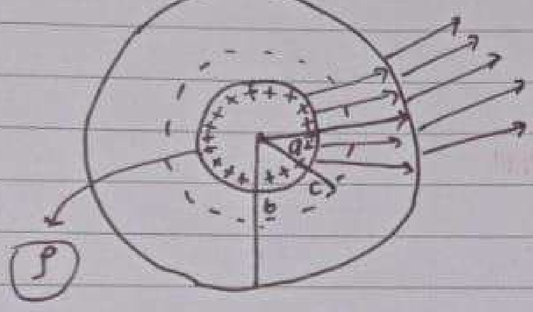
$$\vec{E}(2\pi r l) = \frac{Q}{\varepsilon_0}$$

$$\vec{E} = \frac{Q}{2\pi \varepsilon_0 r l} \vec{r}_0, \text{ dimana } r < R$$

maka $\vec{E}(2\pi R l) = \frac{a}{\varepsilon_0} r_0$, sehingga $\vec{E} = \frac{a}{2\pi \varepsilon_0 R l} \hat{r}_0$

soal:

①



Calculate of $\vec{E}$
1) $r < a$
2) $a < r < b$
3) $r > b$

1) $\vec{E} = 0$

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

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

$$\vec{E}(4\pi r^2) = \frac{1}{\varepsilon_0} \iiint \rho \, d\tau_0$$

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

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

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

3) $r > b$

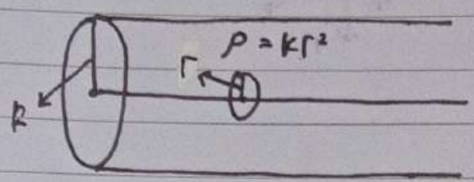
$$\oint \vec{E} \cdot da = \frac{1}{\varepsilon_0} \iiint \rho \, d\tau_0$$

$$= \frac{1}{\varepsilon_0} \iiint \rho r^2 \sin\theta \, dz \, d\phi \, dr$$

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

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

2



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

1). $$\oint \vec{E} \cdot da = \frac{1}{\varepsilon_0} \iiint \rho \, d\tau_0$$

$$\vec{E}(2\pi r \cdot l) = \frac{1}{\varepsilon_0} \iiint (kr^2) \, r \, d\phi \, dz \, dr$$

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

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

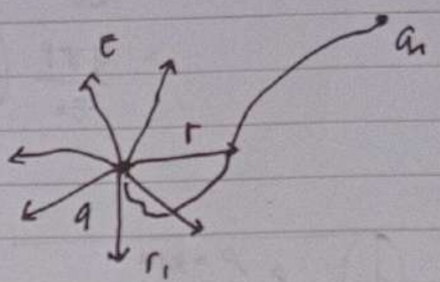
$$\vec{E}(2\pi r \cdot l) = \frac{1}{\varepsilon_0} \int_0^R \int_0^\pi$$

Beda Potensial

Potensial : usaha atau kerja memindahkan muatan dari jauh ke titik tertentu.

$W = F \cdot s$

$$V = \frac{W}{q_n} = \frac{F \cdot s}{q_n} = k\frac{\frac{q_{n_1} \cdot q_{n_2}}{r}}{q_n}$$



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

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

$$= -\int_{r}^{r_1}$$

$$V_1 - V_2 = -\int_{r_1}^{r_2} \vec{E} \cdot d\vec{r}$$

$$\Delta V = -\int_{r_1}^{r_2} \frac{q_n r_1}{4\pi \epsilon r^2}\, dr$$

$$= \frac{q_n}{4\pi \epsilon_0} \int_{r_1}^{r_2} dr$$

$$\Delta V \neq dV$$

$$= -\square \int_{r_1}^{r_2} r^{-2} dr$$

$$= -\square \left(-\frac{1}{r} \Big|_{r_1}^{r_2} \right) = \square \left(\frac{1}{r_2} - \frac{1}{r_1} \right)$$

$$\boxed{V = \frac{1}{4\pi\epsilon_0} \frac{q_n}{r} = k\frac{q_n}{r}}$$