

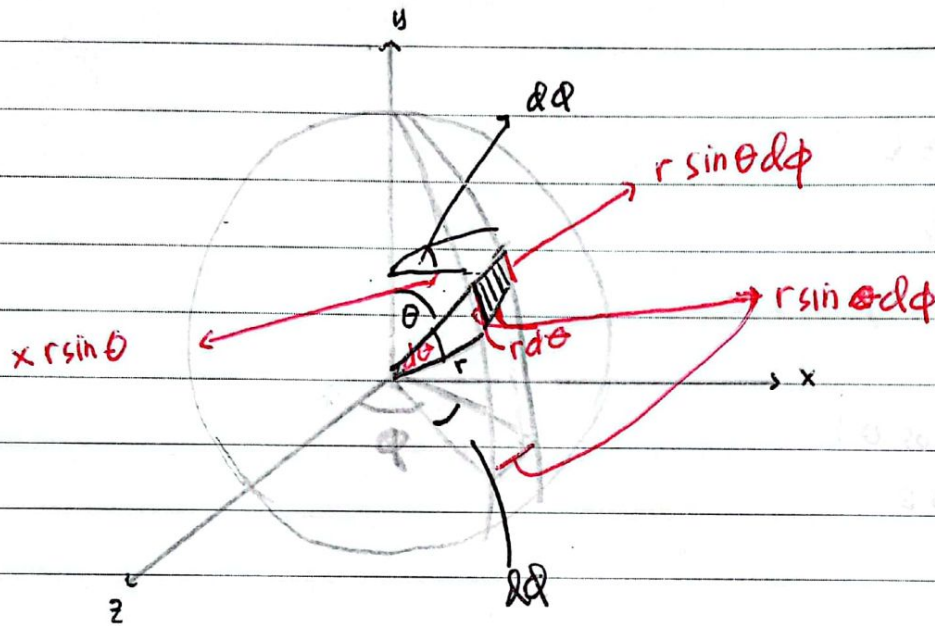
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Pertemuan 4 : Buat Ringkasan tentang Gaya (Listrik Statis)

Sistem Koordinat Bola



$$\sin \theta = \frac{x}{r}$$

$$x = r \sin \theta$$

► Satuan luas : $da = dp \times dl$
 $= r d\theta \cdot r \sin \theta d\phi$
 $= r^2 \sin \theta d\theta d\phi$

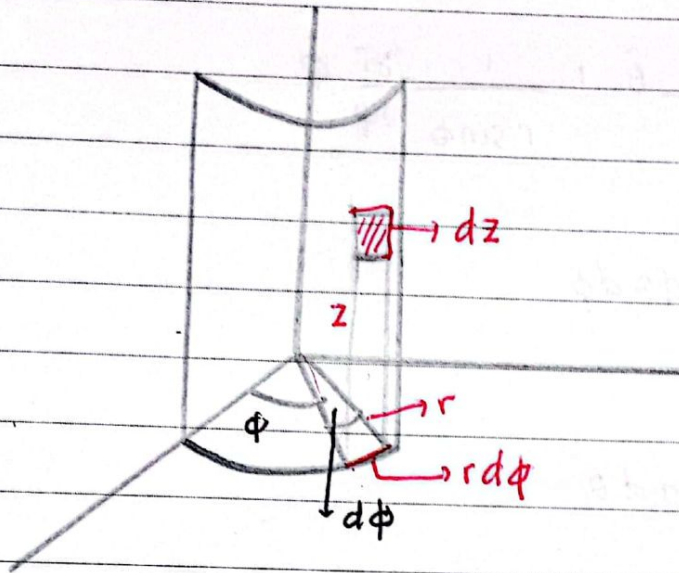
► Satuan volume : $dv = dp \, dl \, dr$
 $= r^2 \sin \theta d\theta d\phi dr$

$$\begin{aligned}\text{Gradien : } \nabla T &= \frac{\partial T}{\partial x} \hat{i} + \frac{\partial T}{\partial y} \hat{j} + \frac{\partial T}{\partial z} \hat{k} \\ &= \frac{\partial T}{\partial r} \hat{r} + \frac{1}{r} \frac{\partial T}{\partial \theta} \hat{\theta} + \frac{1}{r \sin \theta} \frac{\partial T}{\partial \phi} \hat{\phi}\end{aligned}$$

$$\begin{aligned}\text{Luas : } A &= \int_0^{2\pi} \int_0^{\pi} r^2 \sin \theta \, d\theta \, d\phi \\ &= r^2 \int_0^{2\pi} d\phi \int_0^{\pi} \sin \theta \, d\theta \\ &= 2\pi r^2 \int_0^{\pi} \sin \theta \, d\theta \\ &= 2\pi r^2 [\cos \theta]_0^{\pi} \\ &= 2\pi r^2 (1 - (-1)) \\ &= 4\pi r^2\end{aligned}$$

$$\begin{aligned}\text{Volume : } V &= \int_0^{\pi} \int_0^{2\pi} \int_0^r r^2 \sin \theta \, d\theta \, d\phi \, dr \\ &= \left(\int_0^{\pi} \sin \theta \, d\theta \right) \left(\int_0^r r^2 \, dr \right) \left(\int_0^{2\pi} d\phi \right) \\ &= \left(\cos \theta \Big|_0^{\pi} \right) \left(\frac{1}{3} r^3 \right) (2\pi) \\ &= 2 \left(\frac{r^3}{3} \right) (2\pi) \\ &= \frac{4\pi r^3}{3}\end{aligned}$$

Sistem Koordinat Silinder



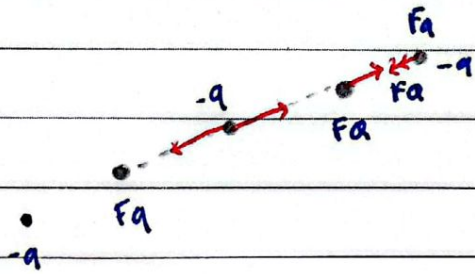
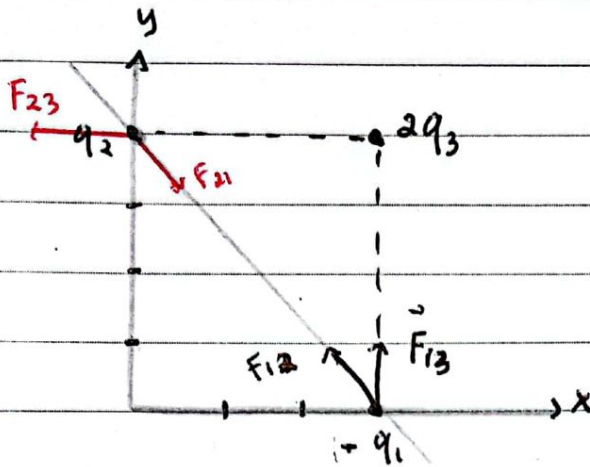
$$\begin{aligned}\text{Luas} &= dA = dp \times dl \\ &= r d\phi dz\end{aligned}$$

$$\text{Volume} = d\bar{v} = r d\phi dz dr$$

Gradien : ∇T

Listrik Statis

$$Q = \pm N\bar{e}$$



$$\vec{F}_{13} = k \frac{q_1 (2q_3)}{q^2} \hat{j}$$

$$k = \frac{1}{4\pi\epsilon_0}$$

$$\vec{F}_{12} = k \frac{q_1 q_2}{5^2} \left(\frac{-3\hat{i} + 4\hat{j}}{5} \right)$$

$$\vec{F}_{\text{total}} = \frac{-3kq_1 q_3}{125} \hat{i} + \left(\frac{2kq_1 q_3}{16} + \frac{4kq_1 q_2}{125} \right) \hat{j}$$

$$\vec{F}_{21} = k \frac{q_2 q_1}{5^2} \left(\frac{-3\hat{i} + 4\hat{j}}{5} \right) = \frac{3kq_2 q_1}{125} \hat{i} - \frac{4kq_2 q_1}{125} \hat{j}$$

$$F_{23} = \frac{-2kq_2 q_3}{3^2} \hat{j}$$

$$\vec{F}_{\text{total}} = \left(\frac{3kq_2 q_1}{125} - \frac{2kq_2 q_3}{9} \right) \hat{i} - \frac{4kq_2 q_1}{125} \hat{j}$$