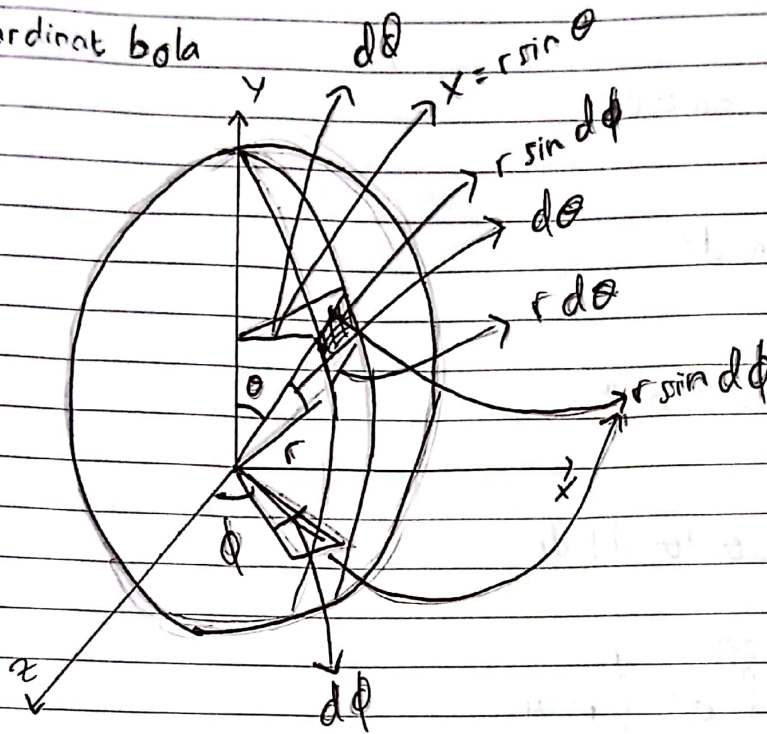


KUISMA

* Sistem Koordinat.

1. koordinat bola



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

$$x = r \sin \theta$$

$$da = dp \times dl$$

$$= r d\theta \cdot r \sin \theta d\phi$$

$$= r^2 \sin \theta d\theta d\phi$$

$$db = dp \cdot dl \cdot dt$$

$$= r^2 \sin \theta \cdot d\theta d\phi dr$$

$$\nabla T = \hat{i} \frac{\partial T}{\partial x} + \hat{j} \frac{\partial T}{\partial y} + \hat{k} \frac{\partial T}{\partial z}$$

$$\nabla T = \frac{\partial T}{\partial r} \hat{r} + \frac{1}{r} \frac{\partial T}{\partial \theta} \hat{\theta} + \frac{1}{r \sin \theta} \frac{\partial T}{\partial \phi} \hat{\phi}$$

$$\nabla \cdot T = \dots$$

$$\nabla \times T = \dots$$

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

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

$$= 2\pi r^2 \int_0^\pi \sin \theta \, d\theta$$

$$= 2\pi r^2 \left[-\cos \theta \right]_0^\pi = 4\pi r^2$$

$$V = \int_0^{2\pi} \int_0^\pi \int_0^r r^2 \sin \theta \, d\theta \, d\phi \, dr$$

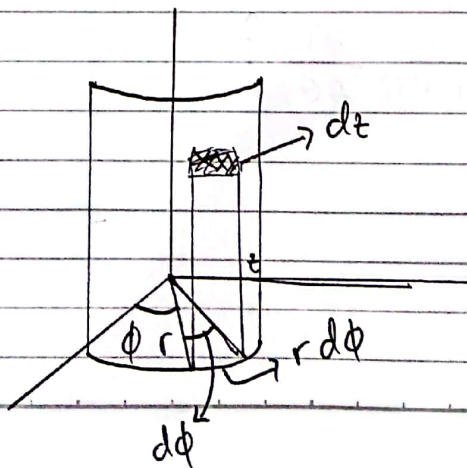
$$= \int_0^{2\pi} \sin \theta \, d\theta \int_0^{2\pi} d\phi \int_0^r r^2 \, dr$$

$$= 2(2\pi) \int_0^r r^2 \, dr$$

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

$$= \frac{4}{3} \pi r^3$$

2. Koordinat Silinder



$$dA = d\rho \times dL$$

$$= r \, d\phi \, dz$$

$$dv = r \, d\phi \, dz \, dr$$

* Listrik Statis

- Gaya Coulomb

- Medan Listrik

• Diskrit

• Non diskrit

Coulomb

Gauss

statis

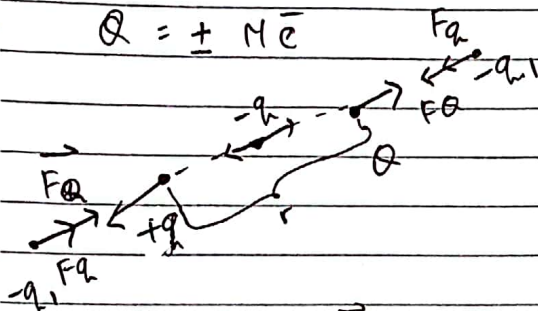
- Potensial

• Diskrit

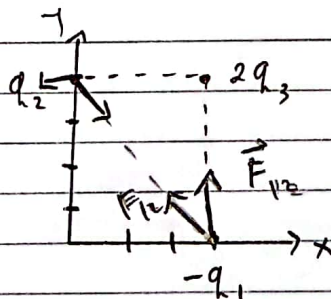
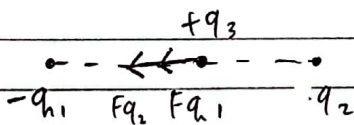
• Non diskrit

- Usaha dan Energi

$$Q = \pm N e$$



$$q = \frac{F}{m} \quad \vec{F} = \frac{1}{4\pi\epsilon_0} \frac{qQ}{r^2} \hat{r}_0$$



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

$$\hat{r}_0 = \frac{\vec{r}}{|\vec{r}|}$$

$$\vec{F}_{q_1} = K \frac{q_1 (2q_3)}{4^2} \hat{j}$$

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

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

$$|\vec{F}| = kq_1 \sqrt{\quad}$$

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

$$\vec{F}_{12} = \frac{-3kq_1 q_2}{125} \hat{i} + \frac{4kq_1 q_2}{125} \hat{j}$$

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

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

$$= \frac{3kq_2 q_1}{125} \hat{i} - \frac{4kq_2 q_1}{125} \hat{j}$$

$$\vec{F}_{23} = \frac{-kq_2 q_3}{3^2} \hat{i}$$

$$= \frac{-2kq_2 q_3}{9} \hat{i}$$