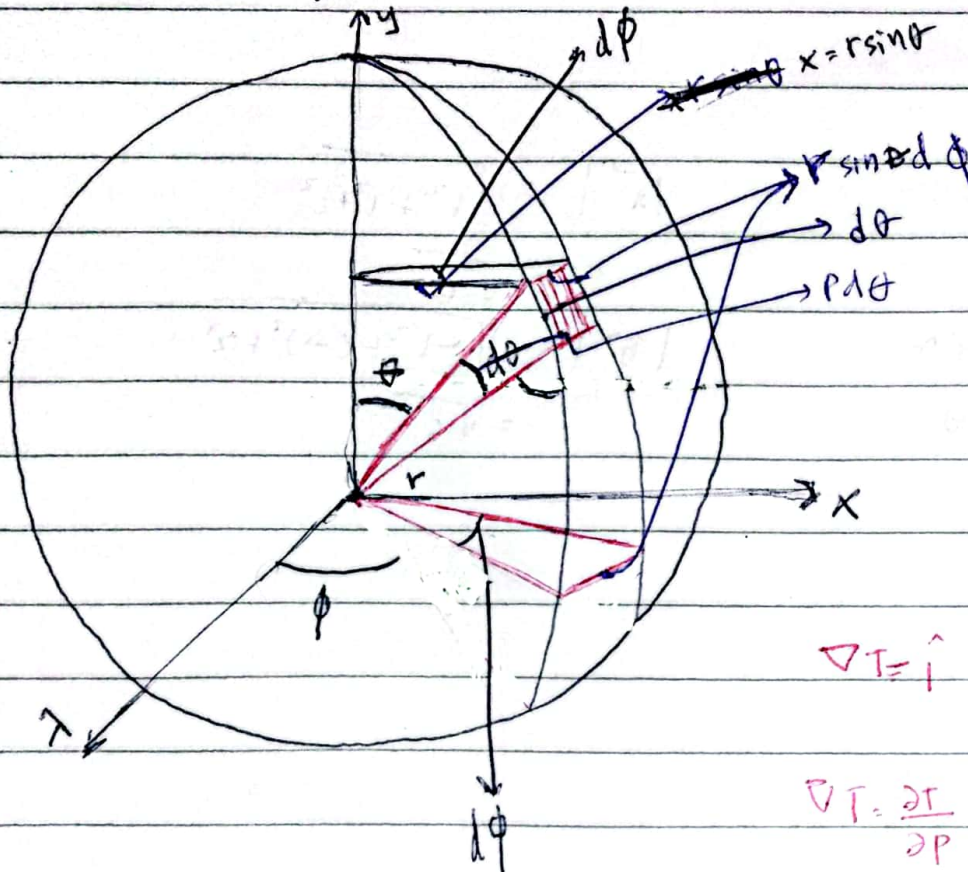


KALUSMA

SISTEM KOORDINAT

1. Koordinat bola



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

$$x = r \sin \theta$$

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

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

$$da^{\text{bag}} = dr \times dl^{\text{bag}} \\ = r d\theta \cdot r \sin \theta d\phi \\ = r^2 \sin \theta d\theta d\phi$$

$$db^{\text{awah}} = dr \cdot dl \cdot dr \\ = r^2 \sin \theta d\theta d\phi dr$$

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

$$\nabla \times T =$$

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

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

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

$$= 0 \left[-\cos \theta \right]_0^\pi = 4\pi r^2$$

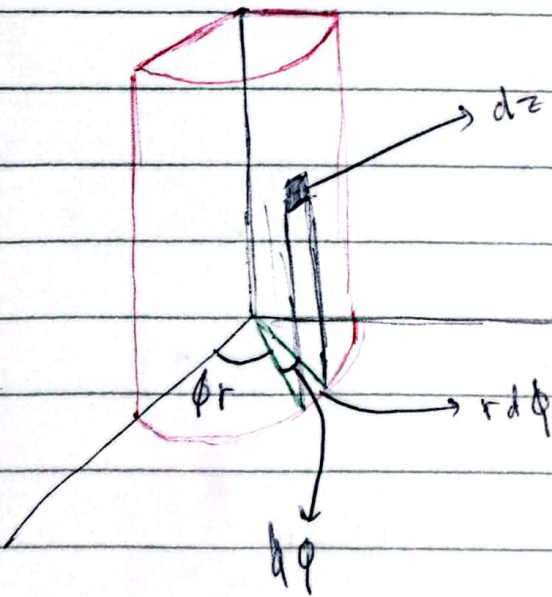
$$V = \int_0^{\pi} \int_0^{2\pi} \int_0^r r^2 \sin \theta \, d\theta \, d\phi \, dr$$

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

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

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

2. Koordinat Silinder



$$dA = dr \times dl$$

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

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

LISTRIK STATIS

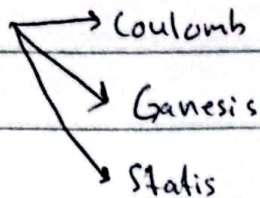
→ Gaya Coulomb

→ Medan Listrik

$$Q = \pm N e$$

• Diskrit

• Non Diskrit

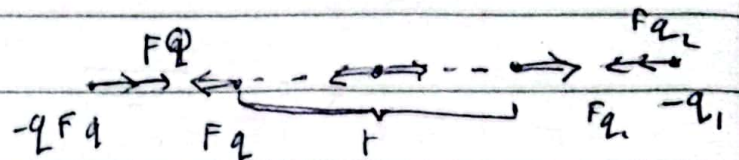


→ Potensial

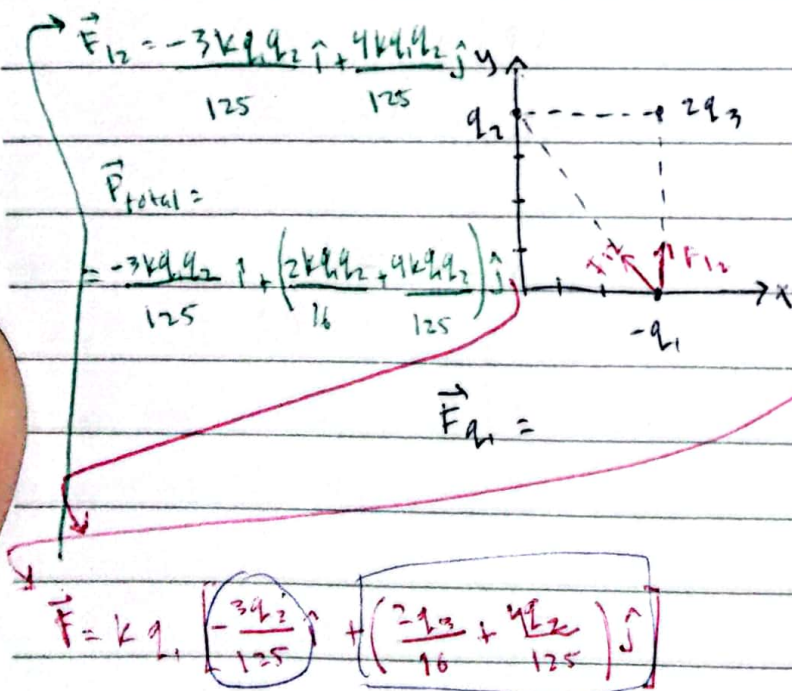
• Diskrit

• Non Diskrit

→ Usaha dan Energi



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



$$\vec{F}_{12} = k \frac{q_1(2q_2)}{r^2} \hat{j}$$

$$\vec{F}_{12} = k \frac{q_1q_2}{5^2} (-3\hat{i} + 4\hat{j})$$

$$\sqrt{3^2 + 4^2} = 5$$

$$\vec{F}_0 = \vec{F}$$

$$|\vec{F}| = kq_1 \sqrt{0^2 + \square^2}$$