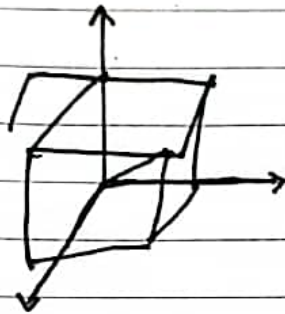


Soal

1. Hitunglah Sudut antara diagonal



$$\vec{A} = \hat{i} + \hat{j} + \hat{k}$$

$$\vec{B} = -\hat{i} + \hat{j} + \hat{k}$$

$$\vec{A} \cdot \vec{B} = |\vec{A}| |\vec{B}| \cos \theta$$

$$2 = \sqrt{6} \cdot \sqrt{6} \cos \theta$$

$$\cos \theta = \frac{2}{\sqrt{6} \cdot \sqrt{6}} = \frac{2}{6} = \frac{1}{3}$$

$$\theta = \cos^{-1} \frac{1}{3}$$

$$2. \vec{A} = 3x^2y\hat{i} + 2yz\hat{j} + xyz\hat{k}$$

$$\vec{B} = yz\hat{i} + 3xy^2\hat{j} + 3xz\hat{k}$$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3x^2y & 2yz & xyz \\ yz & 3xy^2 & 3xz \end{vmatrix}$$

$$= \hat{i} (6x^2yz^2 - 3x^2z) - \hat{j} (9x^3z - y^2z^2) - \hat{k} (3x^3y^2 - 2y^2z^2)$$

=

$$\nabla \times \vec{A} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 3x^2y & 2yz & xyz \end{vmatrix}$$

$$= \hat{i} \left(\frac{\partial}{\partial y} \cdot xyz - \frac{\partial}{\partial z} \cdot 2yz \right) - \hat{j} \left(\frac{\partial}{\partial x} \cdot xyz - \frac{\partial}{\partial z} \cdot 3x^2y \right) - \hat{k} \left(\frac{\partial}{\partial x} \cdot 3x^2y - \frac{\partial}{\partial y} \cdot 2yz \right)$$

$$T = x^2 + 2xy + 3z + 4$$

$$3. \nabla^2 T$$

$$= \nabla \cdot \left(\hat{i} \frac{\partial}{\partial x} + \hat{j} \frac{\partial}{\partial y} + \hat{k} \frac{\partial}{\partial z} \right)$$

$$T = x^2 + 2xy + 3z + 4$$

$$\nabla T = \hat{i} \frac{\partial}{\partial x} (x^2 + 2xy + 3z + 4)$$

$$\nabla T = (2x + 2y)\hat{i} + (2x)\hat{j} + (3)\hat{k}$$

$$\nabla^2 T = 0 + 1 + 1 = 2$$

$$4. \nabla \times (\nabla T)$$

$$= \nabla (2x + 2y)\hat{i} + (2x)\hat{j} + (3)\hat{k}$$

$$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 2x+2y & 2x & 3 \end{vmatrix}$$

$$= \hat{i} \left(\frac{\partial}{\partial y} 3 - \frac{\partial}{\partial z} 2x \right) - \hat{j} \left(\frac{\partial}{\partial x} 3 - \frac{\partial}{\partial z} (2x+2y) \right)$$

$$= \hat{i} \left(\frac{\partial}{\partial y} 3 - \frac{\partial}{\partial z} 2x \right) - \hat{j} \left(\frac{\partial}{\partial x} 3 - \frac{\partial}{\partial z} (2x+2y) \right)$$