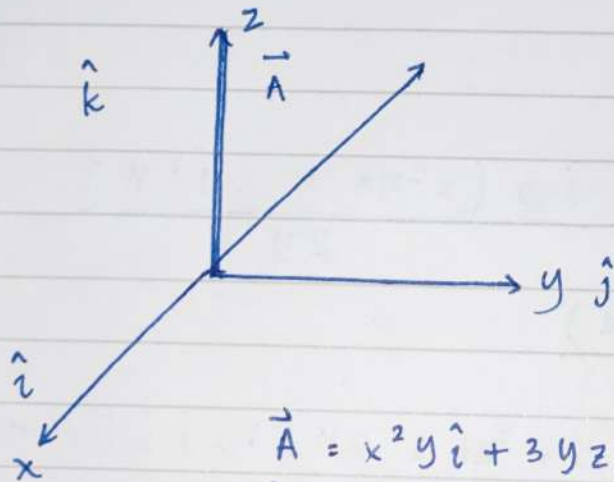


Kelistrikan dan Kemagnetan Operator dalam fisika

1. Analisis Vektor



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

$$\hat{A} = \frac{\vec{A}}{|\vec{A}|} = \frac{x\hat{i} + y\hat{j} + z\hat{k}}{\sqrt{x^2 + y^2 + z^2}}$$

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

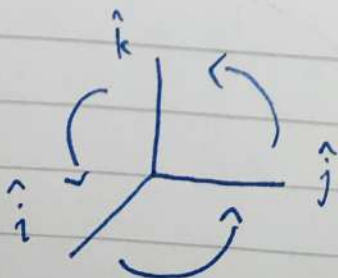
$$\vec{B} = z\hat{i} + 2yx\hat{j} + 3xz\hat{k}$$

$$\vec{A} + \vec{B} = (x^2y + z)\hat{i} + (5yz + 2yx)\hat{j} + (5xz + 2xz)\hat{k}$$

$$\vec{A} \cdot \vec{B} = (x^2y)(z)\hat{i} + (3yz)(2yx)\hat{j} + (2xz)(3xz)\hat{k}$$
$$= x^2yz + 6y^2xz + 6x^2yz$$

$$\vec{A} \times \vec{B} = (3yz \cdot 3xz - 2xy \cdot 2yx)\hat{i} + (2xy \cdot z - x^2y \cdot 3xz)\hat{j}$$
$$+ (x^2y \cdot 2yx - 3yz \cdot z)\hat{k}$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ x^2y & 3yz & 2xz \\ z & 2yx & 3xz \end{vmatrix}$$



Operator Nabla (∇)

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

gradien

$$T = x^2 yz + 3y^2 z$$

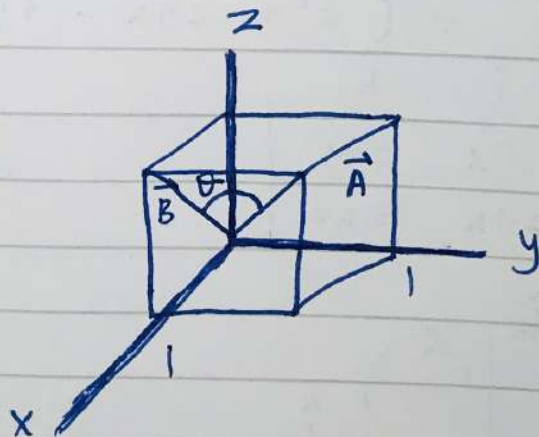
$$\begin{aligned} \nabla T &= \hat{i} \frac{\partial (x^2 yz + 3y^2 z)}{\partial x} + \hat{j} \frac{\partial (x^2 yz + 3y^2 z)}{\partial y} \\ &+ \hat{k} \frac{\partial (x^2 yz + 3y^2 z)}{\partial z} \end{aligned}$$

$$= (2xyz + 3y^2 z) \hat{i} + (x^2 z + 3 \cdot 2yz) \hat{j} + \hat{k} (x^2 y + 3y^2)$$

$$\vec{A} = 2x \hat{i} + 3y \hat{j} - 4z \hat{k}$$

$$\nabla \cdot \vec{A} = \frac{\partial A_x}{\partial x} + \frac{\partial A_y}{\partial y} + \frac{\partial A_z}{\partial z}$$

$$\nabla \times \vec{A} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 2x & 3y & -4z \end{vmatrix}$$



$$\vec{A} = 0\hat{i} + \hat{j} + 2\hat{k}$$

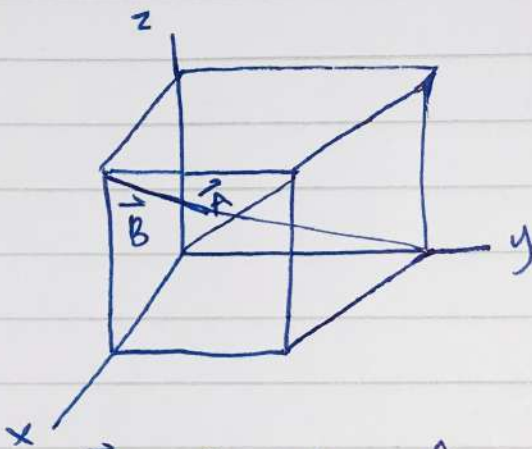
$$\vec{B} = \hat{i} + 0\hat{j} + 2\hat{k}$$

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

$$4 = \sqrt{5} \sqrt{5} \cos \theta$$

$$\cos \theta = \frac{4}{5}$$

$$\theta = \cos^{-1} \frac{4}{5}$$



Sudut ruang

$$\vec{A} = \hat{i} + \hat{j} + 2\hat{k}$$

$$\vec{B} = -\hat{i} - \hat{j} + 2\hat{k}$$

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

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

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