

Alfina Ramadani 2213022051 (B)

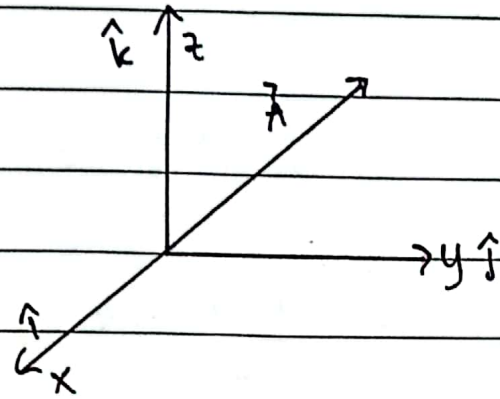
Kalisma

Kamis

22 Februari 2024

Operator dalam fisika

1. Analisis Vektor



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

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

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

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

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

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

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

$$\begin{aligned}&= [(3yz \cdot 3xz)\hat{i} + (2xy \cdot z)\hat{j} + (x^2y \cdot 2yx)\hat{k}] - \\ &\quad [(x^2y \cdot 3xz)\hat{j} + (2xy \cdot 2yx)\hat{i} + (3yz \cdot z)\hat{k}] \\ &= (9xyz^2 - 2x^2y^2)\hat{i} + (2xy - 3x^3yz)\hat{j} \\ &= (9xyz^2 - 4x^2y^2)\hat{i} + (2x^3y^2 - 3yz^2)\hat{k} + \\ &\quad (2xy - 3x^3yz)\hat{j}\end{aligned}$$

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22 Februari 2024Operator Nabla (∇)

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

Gradian

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

$$\nabla T = \hat{i} \cdot \frac{\partial (x^2 y z + 3 y^2 z)}{\partial x} + \hat{j} \cdot \frac{\partial (x^2 y z + 3 y^2 z)}{\partial y} + \hat{k} \frac{\partial (x^2 y z + 3 y^2 z)}{\partial z}$$

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

Divergensi

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

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

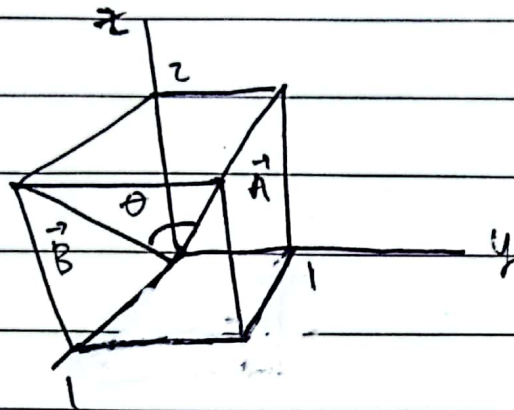
$\nabla \times \vec{A} =$	$\hat{i}$	$\hat{j}$	$\hat{k}$
	$\frac{\partial}{\partial x}$	$\frac{\partial}{\partial y}$	$\frac{\partial}{\partial z}$
	$2x$	$3y$	$-4z$

$$= \left(\frac{\partial}{\partial y} \cdot 4z \right) \hat{i} - \left(\frac{\partial}{\partial z} \cdot 3y \right) \hat{i} + \left(\frac{\partial}{\partial x} \cdot 3x \right) \hat{i} - \left(\frac{\partial}{\partial y} \cdot 2x \right) \hat{j} + \left(\frac{\partial}{\partial z} \cdot 2x \right) \hat{j} - \left(\frac{\partial}{\partial x} \cdot 4z \right) \hat{j}$$

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

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

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

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

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Sudut antar ruang (Diagonal ruang)

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

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

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

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

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

