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No
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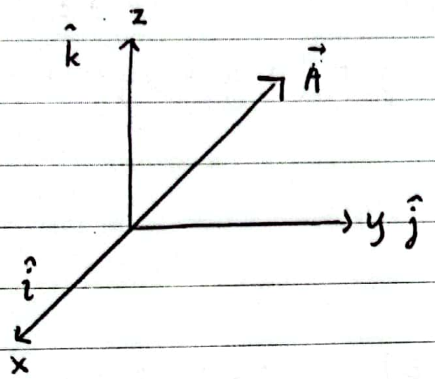
Semester 4

Kelistrikan dan Kemagnetan

Operator Dalam Fisika

1) Analisis Vektor



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

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

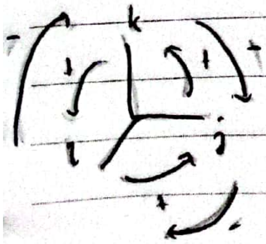
Contoh:

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

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

$$\vec{A} \cdot \vec{B} = (x^2 y \cdot z)ii + (x^2 y)\, 2yx)ij + (x^2 y \cdot 3xz)ik$$
$$+ (3yz \cdot z)ij + (3yz \cdot 2yx)j \cdot j + (3yz \cdot 3xz)jk$$
$$+ (2xy \cdot z)ik + (2xy \cdot 2yx)kj + (2xy \cdot 3xz)kk$$
$$= x^2yz + 6y^2xz + 6x^2yz$$

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



$$= 9xyz^2 i + 2xyz j + x^3 2y^2 k - 3yz^2 k - 9x^2 y i$$
$$- 3x^2 yz\ j$$
$$=$$

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2. Operator Nabla

$$\Gamma = x^2yz + 3y^2z$$

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

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

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

$$\vec{A} = 2x\hat{i} + 3y\hat{h} - 4zk.$$

$$\nabla \cdot \vec{A} = \frac{\partial}{\partial x}(2x) + \frac{\partial}{\partial y}(3y) - \frac{\partial}{\partial z}(4z) = 2 + 3 - 4 = 1$$

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

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

$$= (0-0)i + (0-0)j + (0-0)k =$$

$$= 0$$

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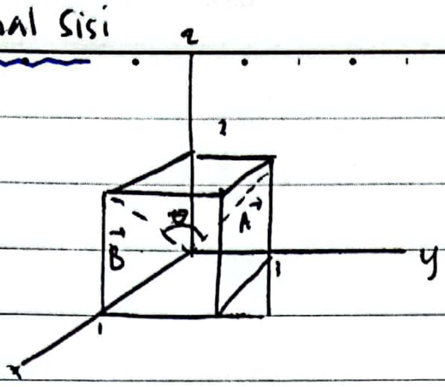
Diagonal Sisi



$\vec{A} = x \cdot i + yj + zk$

$= 0i + j + 2k$

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

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

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

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

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

Diagonal Ruang

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

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

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

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

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

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

$\theta = \text{Inv} \cos \frac{1}{3}$