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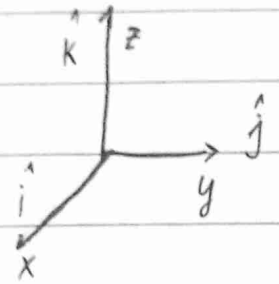
OPERATOR DALAM FISIKA

1 Analisis Vektor



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

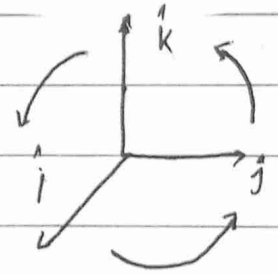
$$\hat{A} = \frac{\vec{A}}{|\vec{A}|} = \frac{x\hat{i} + y\hat{j} + z\hat{k}}{\sqrt{x^2 + y^2 + z^2}}$$

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

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

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

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



$$= \hat{i}(3yz - 3xz) - \hat{j}(x^2y\,3xz - 2xyz) + \hat{k}(x^2y\,2xy - 3yz^2)$$

$$= (9xyz^2 - 4x^2y^2)\hat{i} - (3x^3yz - 2xyz)\hat{j} + (2x^3y^2 - 3y^2)\hat{k}$$

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

$$= x^2yz\,\hat{i}\cdot\hat{i} + x^2y\,2yx\,\hat{i}\cdot\hat{j} + x^2y^3z\,\hat{i}\cdot\hat{k} + 3yz^2\,\hat{j}\cdot\hat{i} + 3yz\,\hat{j}\,2yx\,\hat{i} + 3yz\,3xz\,\hat{j}\cdot\hat{k} + 2xyz\,\hat{i}\cdot\hat{k} + 2xy\,2yx\,\hat{i}\cdot\hat{k} + 2xy\,3xz\,\hat{k}\cdot\hat{k} = x^2yz + 6xy^2z + 6x^2y^2$$

OPERATOR NABLA

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

Gradien

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

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

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

Gradien

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

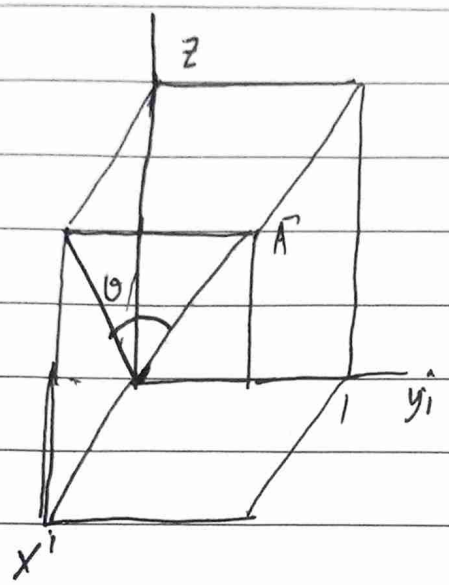
$$\nabla\cdot\vec{A} = \left(\frac{\partial}{\partial x}\right)\hat{i} + \left(\frac{\partial}{\partial y}\right)j + \left(\frac{\partial}{\partial z}\right)\hat{k}\cdot(Vx_i + Vy\,j + V_z k$$

$$\nabla\cdot\vec{A} = \frac{\partial Vx}{\partial x} + \frac{\partial Vy}{\partial y} + \frac{\partial Vz}{\partial z}$$

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

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

$$= 0$$



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

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

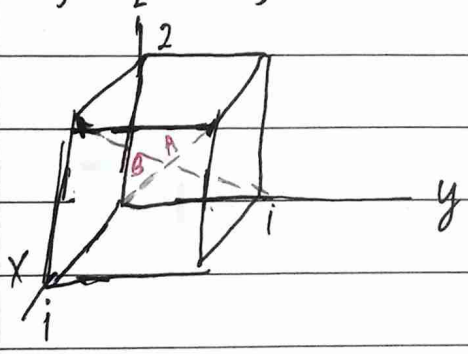
$\vec{A} \cdot \vec{B} = |\vec{A}||\vec{B}| \cos\theta$

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

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

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

Diagonal Ruang



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

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

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

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

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

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

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