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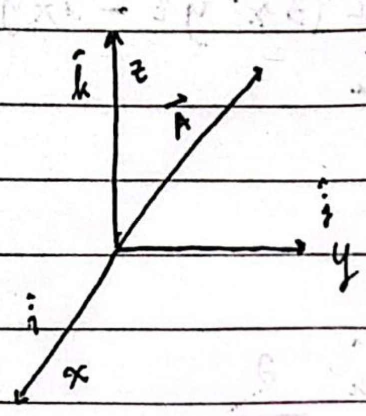
Npm : 2213022042

No.
Date : 22-02-2024

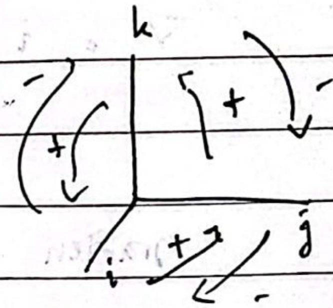
OPERATOR DALAM FISIKA

1. Analisa Vektor



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

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



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

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

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

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

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

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

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

OPERATOR NABLA.

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

gradien

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

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

$= \cancel{2xyz + x^2z + 3z + x^2y + 3y}$

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

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

$\nabla \cdot \vec{A} = \cancel{2i.\,3j - 4k \,.\, 2x\hat{i} + 3y\hat{j} + 4\hat{k}}$

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

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

$$(V_x i + V_y \hat{j} + V_z \hat{k})$$

$$\nabla \cdot \vec{A} = \frac{\partial V_x}{\partial x} + \frac{\partial V_y}{\partial y} + \frac{\partial V_z}{\partial z} = 1$$

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

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

$$= 0$$

Dipindai dengan CamScanner

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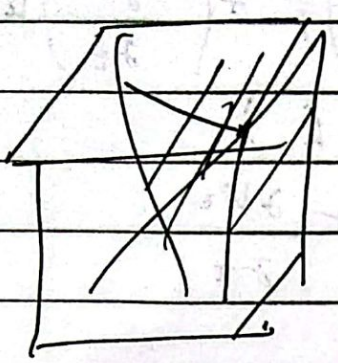


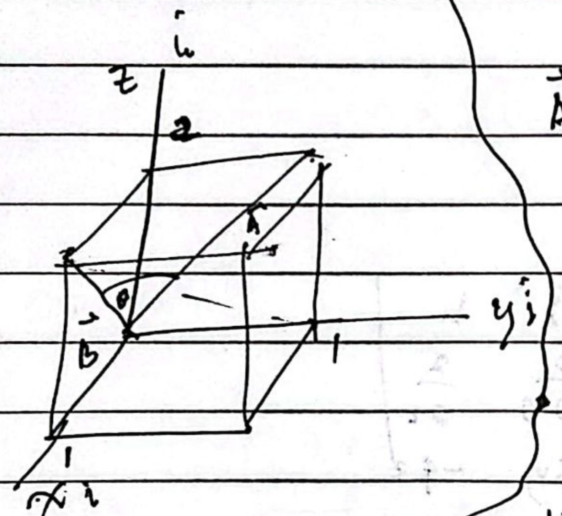
$\vec{A} = \ldots$

$\vec{B} =$

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

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

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



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

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

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

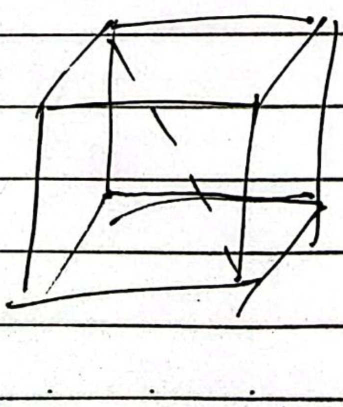
$\cancel{\cos}\ \theta = \text{inv}\cos\frac{4}{5}$

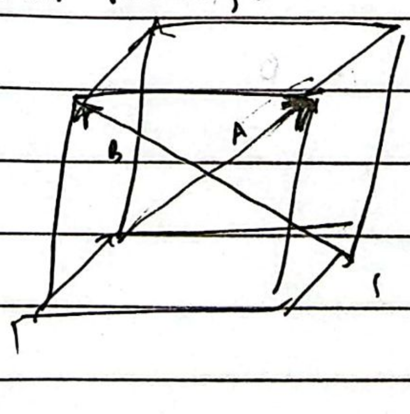
$|\vec{A}| = \sqrt{0\hat{i}^2 + \hat{j}^2 + 2\hat{k}^2} = |\vec{B}|$

$= \sqrt{0+1+4}$

$= \sqrt{5}$

Sudut antara diagonal ruang²





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

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

$|\vec{A}| = \sqrt{1^2 + 1^2 + 2^2}$

$= \sqrt{\cancel{4}6}$

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

$|\vec{B}| = \sqrt{-1^2 + (-1)^2 + 2^2}$

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

$= \sqrt{6}$

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

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

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