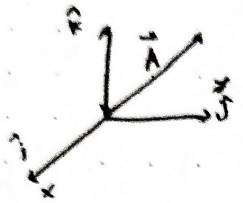
Kelistrikan & Kemagnetan

Nama : Fatna Arianty Sutrisno
NPM : 2213022031

Operasi dalam fisika

1. Analisis vektor



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

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

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

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

$A+B = (x^2y+z)\hat{i} + (3yz+2yx)\hat{j} + (2xy+3xz)\hat{k}$
$= x^2yz\hat{i} + 5y^2zx\hat{j} + 5x^2yz\hat{k}$

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

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

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

2. Operasi nabla

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

gradien

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

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

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

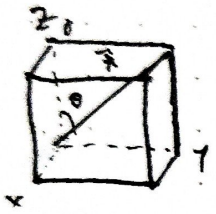
$A = 2x\hat{i} + 3y\hat{j} - 4z\hat{k}$

$\nabla \cdot \vec{A}$

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

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

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



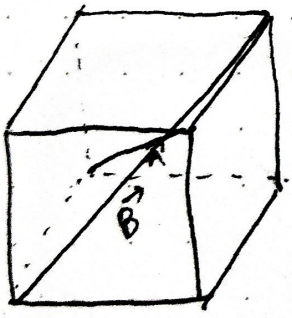
$\vec{A} = 0\hat{i} + \hat{j} + 2\hat{k}$

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

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

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

$\cos\theta = \frac{4}{\sqrt{5}}$ $\quad \theta = \text{Invers cos } \frac{4}{5}$



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

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

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

$2 = \sqrt{6}\sqrt{4}\cos\theta$

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

$1 = \sqrt{6}\cos\theta$