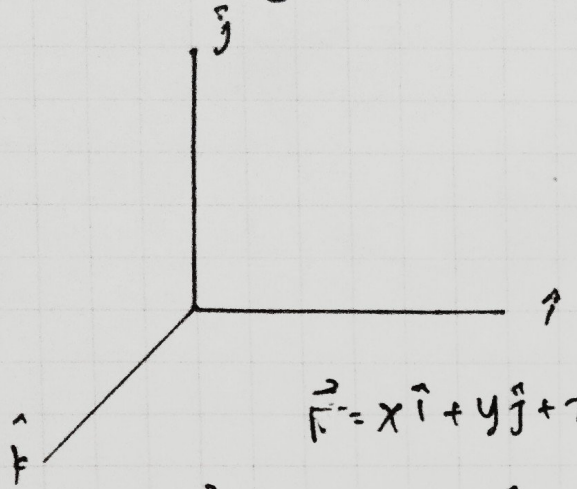
"Kelistrikan dan kemagnetan"

Jumat, 29/3

Role of Matematic in Physics

$\vec{x} = x_1 \hat{i} + x_2 \hat{j} + x_3 \hat{k}$

$\vec{v} = v_1 \hat{i} + v_2 \hat{j} + v_3 \hat{k}$

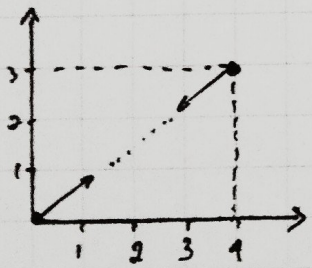


$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

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

$\left.\begin{matrix} i.\hat{i} \\ j.\hat{j} \\ k.\hat{k} \end{matrix}\right\} = 1$

example :

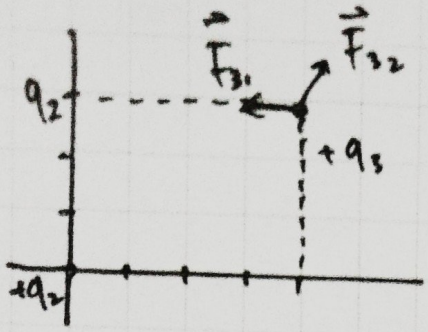


$\vec{F} = k \frac{q_1 q_2}{r^2} \hat{r}$

$= k \frac{q_1 q_2}{\sqrt{3^2 + 4^2}} \left(\frac{-4\hat{i} + 3\hat{j}}{5^2} \right)$

$F.q = k \frac{q_1 q_2}{r^2}$

$= k \frac{q_1 q_2}{5^2} \left(\frac{4\hat{i} + 3\hat{j}}{5^2} \right)$



$$F_{23} = \vec{F}_{31} + \vec{F}_{32}$$

$$= k q_3 \left[\frac{q_1(-\hat{i})}{4^2} + \frac{q_2}{5^2} \frac{(4\hat{i} + 3\hat{j})}{5} \right]$$

r^2

$\hat{r} = \frac{\vec{r}}{|r|}$

$\vec{V}_1 = 4\hat{i} + 2\hat{j} + \hat{k}$

$V_2 = 2\hat{i} + 3\hat{k}$

$\vec{V}_1 \cdot \vec{V}_2 = (4\hat{i} + 2\hat{j} + \hat{k}) \cdot (2\hat{i} + 3\hat{k})$

$= 4\hat{i} + 2\hat{j} + \hat{k}) \cdot (2\hat{i} + 0\hat{j} + 3\hat{k})$

$= 8 + 0 + 3$

$= 11$

$\vec{a} = 3\hat{i} + 4\hat{j} - 3\hat{k}$

$\vec{b} = 2\hat{i} - 3\hat{j} + 2\hat{k}$

a). $\vec{a} \cdot \vec{a} = (3\hat{i} + 4\hat{j} - 3\hat{k}) \cdot (3\hat{i} + 4\hat{j} - 3\hat{k})$

$= 9 + 16 + 9$

$= 34$

b). $\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 4 & -3 \\ 2 & -3 & 2 \end{vmatrix} = \hat{i}(8-9) + \hat{j}(6+6) + \hat{k}(-9-8)$

$= -\hat{i} + 12\hat{j} - 17\hat{k}$

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c). $\vec{a} \cdot \vec{b} = (3\hat{i} + 4\hat{j} - 3\hat{k}) \cdot (2\hat{i} - 3\hat{j} + 2\hat{k})$

$= 6 - 12 - 6$

$= \underline{-12}$

$\vec{a} = 4\hat{i} - 5\hat{j} + \hat{k}$

$\vec{b} = 2\hat{i} + 3\hat{j} - 2\hat{k}$

$$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & -5 & 1 \\ 2 & 3 & -2 \end{vmatrix}$$