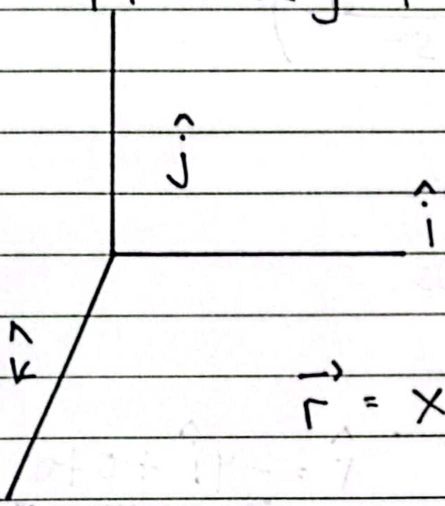
No $14.02.2025$
Date

Kelistrikan dan Kemagnetan

Role of Mathematics in Physics

$$\vec{X} = x_1\hat{i} + x_2\hat{j} + x_3\hat{k}$$
$$\vec{v} = v_1\hat{i} + v_2\hat{j} + v_3\hat{k}$$



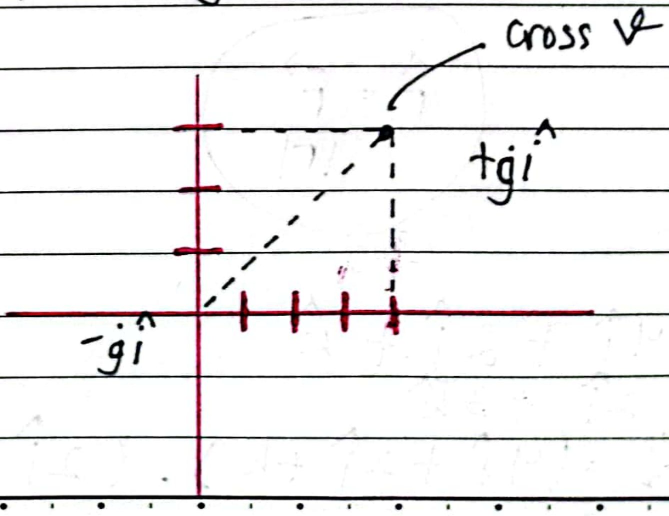
$\vec{r}$

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

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

$\hat{i} \times \hat{i} = 0$	$\hat{i} \times \hat{j} = -\hat{j}$
$\hat{j} \times \hat{j} = 0$	$-\hat{j} \times \hat{i} = \hat{k}$
$\hat{k} \times \hat{k} = 0$	$\hat{j} \times \hat{k} = -\hat{k}$
$\hat{k} \times \hat{i} = -\hat{i}$	$-\hat{k} \times \hat{j} = \hat{i}$
$-\hat{i} \times \hat{k} = \hat{j}$	

Example:



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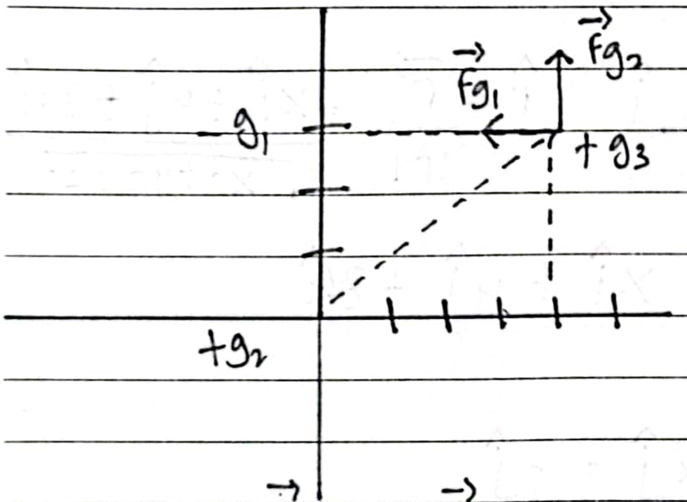
$$F.q = \frac{k . q_1 q_2}{r^2}$$
$$= \frac{k . q_1 q_2}{5^2} \left(\frac{4\hat{i} + 3\hat{j}}{5^2} \right)$$

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



$$\hat{r} = \frac{-4\hat{i} + 0 + 0}{\sqrt{4^2 + 0^2 + 0^2}}$$
$$= -\hat{i}$$

$$F.g_3 = \vec{Fg_1} + \vec{Fg_2}$$
$$= k . g_3 \left[\frac{g_1(-\hat{i})}{4^2} + \frac{g_2}{5^2} \left(\frac{4\hat{i} + 3\hat{j}}{5} \right) \right]$$

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

$$\vec{V_1} = 4\hat{i} + 2\hat{j} + \hat{k}$$
$$\vec{V_2} = 2\hat{i} + 3\hat{k}$$
$$\vec{V_1} . \vec{V_2} = (4\hat{i} + 2\hat{j} + k) . (2\hat{i} + 3\hat{k})$$

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$= (6\hat{i} + 2\hat{j} + 3\hat{k})$

$= 8 + 3 + 0$

$= 11$

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

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

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

$= 9\hat{i} + 16\hat{j} - 9\hat{k})$ | $9\hat{i} + 16\hat{j} + 9\hat{k}$

$= 16$ | 34

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

$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 4 & -3 \\ 2 & -3 & 2 \end{vmatrix} = (\quad)$

$= i(8-9) + \hat{j}(6+6)\ \hat{k}(-9-8)$

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

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

$= 6\hat{i} - 12\hat{j} - 6\hat{k})$

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

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

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

$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & -5 & 1 \\ 2 & 3 & -2 \end{vmatrix} = ((-10) - 3) . (-8 - 2) . 12 - (-10))$

$=$