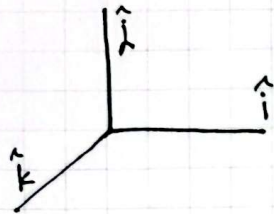


Role of mathematic in physics

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

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



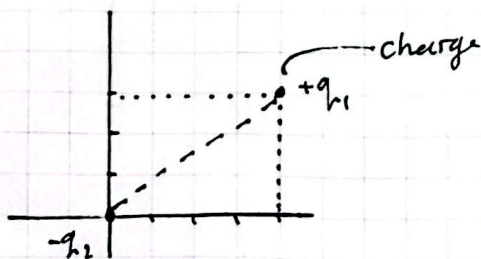
$$\vec{r} = x \hat{i} + y \hat{j} + z \hat{k}$$

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

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

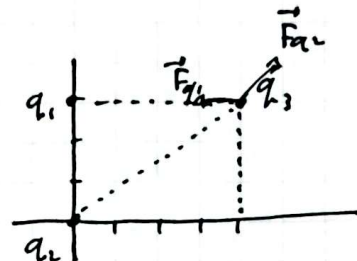
$$\left. \begin{matrix} \hat{i} \cdot \hat{i} \\ \hat{j} \cdot \hat{j} \\ \hat{k} \cdot \hat{k} \end{matrix} \right\} = 1 \quad \left. \begin{matrix} \hat{i} \cdot \hat{j} \\ \hat{i} \cdot \hat{k} \\ \hat{j} \cdot \hat{k} \end{matrix} \right\} = 0$$

example :



$$\begin{aligned} \vec{F}_{q_1} &= k \frac{q_1 q_2}{r^2} \hat{r} \\ &= k \frac{q_1 q_2}{\sqrt{3^2 + 4^2}} \frac{(-4 \hat{i} - 3 \hat{j})}{5} \\ &= k \frac{q_1 q_2}{5^2} \frac{(-4 \hat{i} - 3 \hat{j})}{5} \end{aligned}$$

$$\begin{aligned} \vec{F}_{q_2} &= k \frac{q_1 q_2}{r^2} \hat{r} \\ &= k \frac{q_1 q_2}{5^2} \frac{(4 \hat{i} + 3 \hat{j})}{5} \end{aligned}$$



alat ukur ketikiri
(-)

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

$$\vec{F}_{q_3} = \vec{F}_{q_1} + \vec{F}_{q_2}$$

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

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

$$\begin{aligned} \hat{r} &= \frac{(4 \hat{i} + 3 \hat{j})}{\sqrt{4^2 + 3^2}} \\ &= \frac{(4 \hat{i} + 3 \hat{j})}{5} \end{aligned}$$

example :

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

$$\vec{v}_2 = 2 \hat{j} + 3 \hat{k}$$

$$\vec{v}_1 \cdot \vec{v}_2 = ?$$

$$\begin{aligned} &= (4 \hat{i} + 2 \hat{j} + \hat{k}) \cdot (2 \hat{j} + 3 \hat{k}) \\ &= 8 + 2 + 3 \\ &= 11 \end{aligned}$$

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

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

a) $\vec{a} \cdot \vec{a}$

b) $\vec{a} \times \vec{b}$

c) $\vec{a} \cdot \vec{b}$

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) $\vec{a} \times \vec{b}$

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

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

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

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

$$= 6 - 12 - 6$$

$$= -12$$