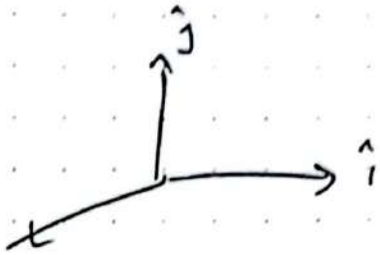
KELISTRIKAN & KEMAGNETAN 14/2 2025

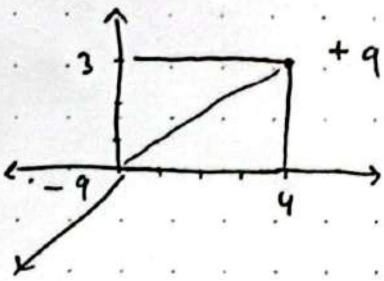
Role of matematic in physics

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



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

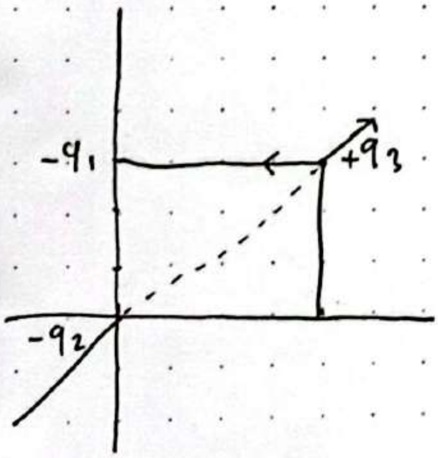
$$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$$



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

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

$$\hat{r} = \frac{\vec{r}}{|r|} = \frac{(4\hat{i}+3\hat{j})}{\sqrt{4^2+3^2}}$$



$$F_{q_3} = \vec{F}_{31} + \vec{F}_{32}$$
$$= k\, q_3\left[\frac{q_1(-\hat{i})}{4^2} + \frac{q_2}{5^2}\frac{(4\hat{i}+3\hat{j})}{5}\right]$$

$$\vec{v}_1 = 4\hat{i} + 3\hat{j} + \hat{k}$$
$$\vec{v}_2 = 2\hat{i} + 3\hat{k}$$

$$\vec{v}_1 \cdot \vec{v}_2 = (4\hat{i} + 3\hat{j} + \hat{k}) . (2\hat{i} + 3\hat{k})$$
$$= (8\hat{i} + 0\hat{j} + 3\hat{k})$$
$$= (8 + 3) = 11$$

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

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

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

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

$= 16$

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

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

$= -1\hat{i} - 12\hat{j} + (-17)\hat{k}$

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

$= 6(1) + 12 - 6$

$=$

+ + + (kiri kiri kiri)

+ − + (kiri kiri kanan)