

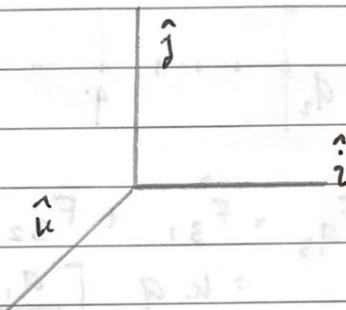
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Role of mathematic in physics

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

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



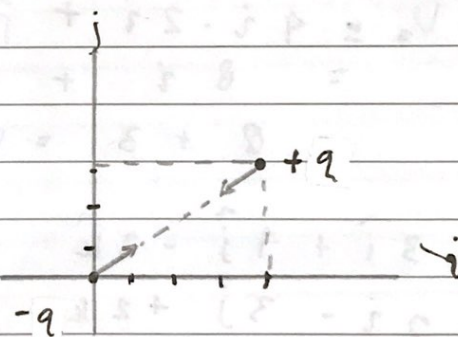
$$\hat{r} = \frac{\vec{r}}{|\vec{r}|} = \frac{x\hat{i} + y\hat{j} + z\hat{k}}{\sqrt{x^2 + y^2 + z^2}}$$

$$\left. \begin{array}{l} \hat{i} \cdot \hat{i} \\ \hat{j} \cdot \hat{j} \\ \hat{k} \cdot \hat{k} \\ \hat{i} \cdot \hat{j} \end{array} \right\} = 1$$

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

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

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



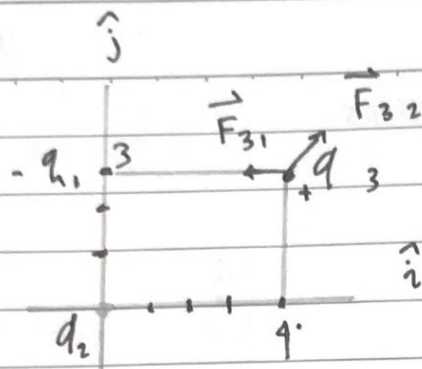
$$\vec{F}_{-q} = k \frac{q_1 q_2}{r^2} \hat{r} = k \frac{q_1 q_2}{\sqrt{3^2 + 4^2}}$$

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

$$\hat{r} = -\hat{i}$$

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

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

$$\vec{V}_2 = 2\hat{i} + 3\hat{k}$$

$$\begin{aligned} \vec{V}_1 \cdot \vec{V}_2 &= 4\hat{i} \cdot 2\hat{i} + \hat{k} \cdot 3\hat{k} \\ &= 8 + 3 = 11 \end{aligned}$$

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

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

$$\begin{aligned} a) \vec{a} \cdot \vec{a} &= (3\hat{i} + 4\hat{j} - 3\hat{k}) \cdot (3\hat{i} + 4\hat{j} - 3\hat{k}) = 9 + 16 + 9 \\ &= 34 \end{aligned}$$

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

$$\begin{aligned} c) \vec{a} \cdot \vec{b} &= 6 - 12 - 6 \\ &= -12 \end{aligned}$$

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

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$$\begin{aligned} & i(8-9) + j(6+4) + k(-9-8) \\ & = -i + 12j - 17k \end{aligned}$$

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

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

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

$$\begin{aligned} & = \hat{i}(10-3) + \hat{j}(-8-2) + \hat{k}(12+10) \\ & = 7\hat{i} - 10\hat{j} + 22\hat{k} \end{aligned}$$