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Materi

Role of ~~Mathematic~~ Mathematic in physics

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

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

$$|\vec{r}| = \sqrt{x^2 + y^2 + z^2}$$

$$\vec{F} = \frac{x_1 \hat{i} + x_2 \hat{j} + x_3 \hat{k}}{\sqrt{x^2 + y^2 + z^2}}$$

$$\hat{i} \times \hat{i} = 0$$

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

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

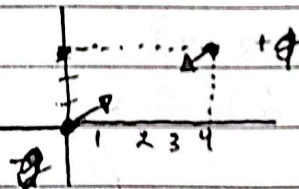
$$\hat{j} \times \hat{i} = -\hat{k}$$

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

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

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

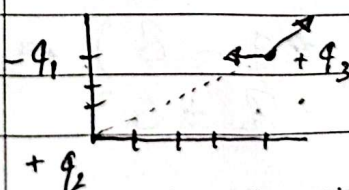
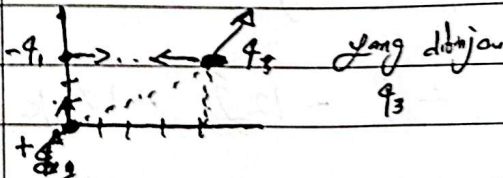
$$\hat{r} = \frac{x_1 \hat{i} + x_2 \hat{j} + x_3 \hat{k}}{\sqrt{x^2 + y^2 + z^2}}$$



$$\vec{F}_{12} = k \frac{q_1 q_2}{r^2} \hat{r}$$

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

$$\vec{F}_{-q} = k \frac{q_1 q_2}{5^2} \cdot \frac{(4\hat{i} + 3\hat{j})}{5^2}$$



$$F_{23} = F_{31} + F_{32}$$

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

Bio

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

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

$$\begin{aligned}\vec{u}_1 \cdot \vec{u}_2 &= (4 \cdot 2) + 0 + (1 \cdot 3) \\ &= 8 + 3 = 11\end{aligned}$$

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

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

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

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

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

$$\begin{aligned}\vec{a} \cdot \vec{b} &= (3 \cdot 2) + (4 \cdot (-3)) + ((-3) \cdot 2) \\ &= 6 + (-12) + (-6) \\ &= -12\end{aligned}$$

$$\begin{aligned}\vec{a} \times \vec{b} &= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 4 & -3 \\ 2 & -3 & 2 \end{vmatrix} = +\hat{i}((4)(2) - 9) + \hat{j}((-6) - 6) \\ &\quad + \hat{k}(-9 - 8) \\ &= -\hat{i} - 12\hat{j} - 17\hat{k}\end{aligned}$$

$$\begin{aligned}&= -\hat{i}(-9 - 8) + \hat{j}(6 + 6) \\ &\quad + \hat{k}(-9 + 9) \\ &= \end{aligned}$$

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

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

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

$$= 7\hat{i} + 10\hat{j} + 22\hat{k}$$

$$= \cancel{7\hat{i}(3-10)} + \hat{j}(-8-2) + \hat{k}(-10-12)$$

$$= 7\hat{i} + 10\hat{j} + 22\hat{k}$$

$$\vec{A} \times \vec{B} = (A_x\hat{i} + A_y\hat{j} + A_z\hat{k}) \times (B_x\hat{i} + B_y\hat{j} + B_z\hat{k})$$

$$= (A_y B_z - A_z B_y)\hat{i} + (A_z B_x - A_x B_z)\hat{j} + (A_x B_y - A_y B_x)\hat{k}$$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$