

Mechanics Quiz - group A

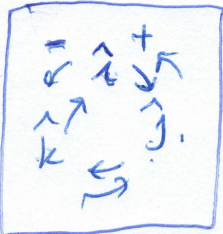
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KEY

1. Let $A = 2\hat{i} + 2\hat{j} + 3\hat{k}$ and $B = 3\hat{i} + 2\hat{j} + \hat{k}$. Find $A \times B$

$$\vec{a} = a_x \hat{i} + a_y \hat{j} + a_z \hat{k}$$

$$\vec{b} = b_x \hat{i} + b_y \hat{j} + b_z \hat{k}$$



$$\vec{a} \times \vec{b} = a \cdot b \cdot \sin \theta$$

$$\sin 0 = 0 \quad \sin 90 = 1$$

$$\vec{a} \times \vec{b} = a_x b_y \hat{k} + a_x b_z (-\hat{j}) + a_y b_x (-\hat{k}) + a_y b_z \hat{i} + a_z b_x \hat{j} + a_z b_y (-\hat{i})$$

$$\begin{aligned} \hat{i} \times \hat{i} &= \hat{i} \cdot \hat{i} \cdot \sin 0 = 0 \\ \hat{j} \times \hat{j} &= \hat{j} \cdot \hat{j} \cdot \sin 0 = 0 \\ \hat{k} \times \hat{k} &= \hat{k} \cdot \hat{k} \cdot \sin 0 = 0 \end{aligned}$$

$$\vec{a} \times \vec{b} = (a_y b_z - a_z b_y) \hat{i} + (a_z b_x - a_x b_z) \hat{j} + (a_x b_y - a_y b_x) \hat{k}$$

$$a_x = 2 \quad a_y = 2 \quad a_z = 3$$

$$b_x = 3 \quad b_y = 2 \quad b_z = 1$$

$$\vec{a} \times \vec{b} = (2 \cdot 1 - 3 \cdot 2) \hat{i} + (3 \cdot 3 - 2 \cdot 1) \hat{j} + (2 \cdot 2 - 2 \cdot 3) \hat{k}$$

$$\vec{a} \times \vec{b} = -4\hat{i} + 7\hat{j} - 2\hat{k}$$