Al-Mustaqbal University

college of sciences

Department of Biology

Bio Physics

second lecture

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First Stage

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EX3:- Find $\vec{A}+\vec{B}$ if $\vec{A}=2\hat{i}+2\hat{j}$
$\vec{B}=2\hat{i}-4\hat{j}$
and then Find the magnetud of $\vec{A}+\vec{B}$

Sol//

$$\vec{A}+\vec{B}=(2\hat{i}+2\hat{j})+(2\hat{i}-4\hat{j})$$
$$=(2+2)\hat{i}+(2-4)\hat{j}$$
$$=\underbrace{4}_{A_x+B_x}\hat{i}-\underbrace{2}_{A_y+B_y}\hat{j}$$

$\vec{A}+\vec{B}$ ديجاد وضعة

$$\vec{A}+\vec{B}=|\vec{A}+\vec{B}|=\sqrt{(A_x+B_x)^2+(A_y+B_y)^2}$$
$$=\sqrt{(4)^2+(-2)^2}=\sqrt{16+4}=\sqrt{20}$$
$$=4.5$$

EX4:- If $\vec{A}=2\hat{i}+3\hat{j}$ and $\vec{B}=-\hat{i}+2\hat{j}$
Find ① $\vec{A}\cdot\vec{B}$ ② angle θ between $\vec{A}$ and $\vec{B}$

Sol// ①
$$\vec{A}\cdot\vec{B}=A_xB_x+A_yB_y+A_zB_z$$

القانون الاول للضرب بعدم وجود زاوية

$$\vec{A}\cdot\vec{B}=(2\hat{i}+3\hat{j})\cdot(-\hat{i}+2\hat{j})$$
$$=(2\hat{i}\cdot-\hat{i})+(3\hat{j}\cdot2\hat{j})$$
$$=-2+6=4$$
$$\vec{A}\cdot\vec{B}=4$$

$\hat{i}\cdot\hat{i}=\hat{j}\cdot\hat{j}=\hat{k}\cdot\hat{k}=1$
$\hat{i}\cdot\hat{j}=\hat{i}\cdot\hat{k}=\hat{j}\cdot\hat{k}=0$

EX4 (2) لايجاد الزاوية بين المتجهين نستخدم قانون الضرب العددي الثاني (4)

$$\vec{A}\cdot\vec{B} = AB\cos\theta$$

قانون الضرب العددي بوجود زاوية

نوجد قيمة المتجه $\vec{A}$

$$\vec{A} = \underset{A_x}{2}\hat{i} + \underset{A_y}{3}\hat{j}$$

$$\vec{A} = |\vec{A}| = A = \sqrt{A_x^2 + A_y^2} = \sqrt{(2)^2+(3)^2} = \sqrt{4+9} = \sqrt{13}$$

نوجد قيمة المتجه $\vec{B}$

$$\vec{B} = \underset{B_x}{-1}\hat{i} + \underset{B_y}{2}\hat{j}$$

$$\vec{B} = |\vec{B}| = B = \sqrt{B_x^2 + B_y^2} = \sqrt{(-1)^2+(2)^2} = \sqrt{1+4} = \sqrt{5}$$

$$\vec{A}\cdot\vec{B} = 4$$

من المطلب الاول

$$\therefore \vec{A}\cdot\vec{B} = AB\cos\theta$$

$$\cos\theta = \frac{\vec{A}\cdot\vec{B}}{AB} \Rightarrow \cos\theta = \frac{4}{\sqrt{13}\sqrt{5}}$$

$$\cos\theta = \frac{4}{8.06} \Rightarrow \cos\theta = 0.49$$

$$\theta = \cos^{-1} 0.49$$

$$\therefore \theta = 60.6$$

EX5:- If $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = -\hat{i} + 2\hat{j}$

Find $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$

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

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

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

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

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} \\ A_x & A_y \\ B_x & B_y \end{vmatrix} = \begin{vmatrix} \hat{i} & \hat{j} \\ 2 & 3 \\ -1 & 2 \end{vmatrix}$$

$$\vec{A} \times \vec{B} = \hat{K}(A_x B_y - A_y B_x)$$

$$= \hat{K}(2 \times 2 - (3 \times -1)) = \hat{K}(4 + 3)$$

$$= 7\hat{K}$$

$$-\vec{B} \times \vec{A} = \begin{vmatrix} \hat{i} & \hat{j} \\ -1 & 2 \\ 2 & 3 \end{vmatrix} = \hat{K}(B_x A_y - B_y A_x)$$

$$= \hat{K}((-1 \times 3) - 2 \times 2)$$

$$= K(-3 - 4$$

$$= -7\hat{K}$$

$$\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$$

$$7\hat{K} = -7\hat{K}$$