

# Chapter (3)

(1)  
Assignment

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Ch "3"

$$\textcircled{1} \vec{B} = 4.0\hat{j} + 3.0\hat{k} \quad |\vec{B}| = \sqrt{16+9} = 5$$

$$\vec{Y} = 0\hat{i} + 3\hat{j} + 0\hat{k}$$

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

$$(4)(1)(\hat{i}) \cdot (\hat{i}) = 4 \times 1 \times 0$$

$$\frac{4}{5} = \cos \theta$$

$$\theta = 37^\circ$$


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$$\textcircled{2} \vec{A} = (5.0\hat{i} + 3.0\hat{j}) \text{ m}$$

$$|\vec{B}| = 6 \quad \theta_B = 120^\circ$$

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

$$B_x = B \cos 120 = -3$$

$$B_y = B \sin 120 = 5.2$$

$$\therefore \vec{B} = (-3.0\hat{i} + 5.2\hat{j}) \text{ m}$$

$$\begin{aligned} \therefore \vec{A} - \vec{B} &= [5.0 - (-3.0)]\hat{i} + [3.0 - 5.2]\hat{j} \\ &= 8.0\hat{i} + -2.2\hat{j} \end{aligned}$$



$$\textcircled{3} \vec{a} = 3.0\hat{i} + 4.0\hat{j}$$

$$\vec{b} = 5.0\hat{i} - 2.0\hat{j}$$

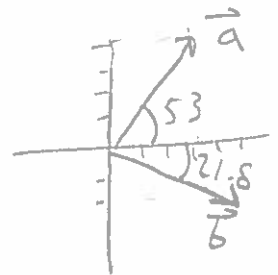
$$\theta_{ab} = ?$$

$$\theta_a = \tan^{-1}\left(\frac{4}{3}\right) = 53^\circ$$

$$\theta_b = \tan^{-1}\left(\frac{-2}{5}\right) = -21.8^\circ$$

$$\theta_{ab} = 53 + 21.8 \approx 75^\circ$$


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(4)

$$\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$$

$$\vec{B} = 4\hat{i} + 4\hat{j} + 0\hat{k}$$

$$\vec{C} = 2\hat{i} + 0\hat{j} + 2\hat{k}$$

$$\vec{A} \cdot (\vec{B} \times \vec{C})$$

$$\vec{B} \times \vec{C} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & 4 & 0 \\ 2 & 0 & 2 \end{vmatrix} = \hat{i}(16-0) - \hat{j}(16-0) + \hat{k}(12-8)$$

$$= 16\hat{i} - 16\hat{j} + 4\hat{k}$$

$$\vec{A} \cdot (\vec{B} \times \vec{C}) = (2\hat{i} + 3\hat{j} + 4\hat{k}) \cdot (16\hat{i} - 16\hat{j} + 4\hat{k})$$

$$= 32 - 48 + 16 = 0$$

(5)

$$|\vec{A}_x| = 12 \hat{?} \quad \vec{A}_y = |\vec{A}| \sin \theta$$

$$|\vec{A}| = 25 \quad 12 = 25 \sin \theta$$

$$\sin \theta = \frac{12}{25} \quad \theta = \sin^{-1} \left( \frac{12}{25} \right)$$

(6)

$$\vec{i} \cdot (\vec{j} \times \vec{k}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix} = \hat{i}(1-0) + 0\hat{j} + 0\hat{k} = \hat{i}$$

$$\therefore \vec{i} \cdot (\vec{j} \times \vec{k}) = \hat{i} \cdot \hat{i} = 1$$

(7)

$$\vec{A} = 3\hat{i} + 5\hat{j} + 2\hat{k}$$

$$\vec{B} = 2\hat{i} + 4\hat{j} - 9\hat{k}$$

$$\vec{A} \perp \vec{B} \Rightarrow \vec{A} \cdot \vec{B} = 0$$

$$0 = 6 + 20 - 18 = 8 \neq 0$$

(8)

$$B_x = 25 \cos 130^\circ = -16$$

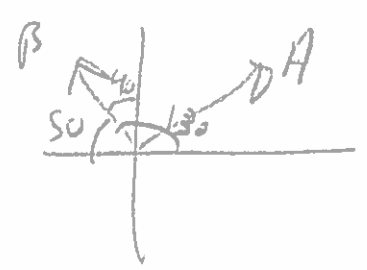
$$B_y = 25 \sin 130^\circ = +19$$

$$\vec{B} = -16\hat{i} + 19\hat{j}$$

$$\vec{A} = 28\hat{i} + 11\hat{j}$$

$$|\vec{A} + \vec{B}| = \sqrt{(12)^2 + (30)^2} = \sqrt{32}$$

$\theta_B = 130^\circ$



9)  $\vec{A} = -6i + 14j$

3

$|\vec{B}| = 2|\vec{A}|$   $\theta_B = \text{opposite to } \vec{A} \text{ direction}$

$|\vec{A}| = \sqrt{36 + 14^2} = 15.2$

$|\vec{B}| = 30.5$

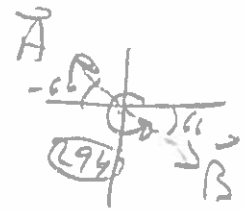
$\theta_A = \tan^{-1} \frac{14}{-6} = -66^\circ$

$\therefore \theta_B = 360^\circ + (-66) = 294^\circ$

$B_x = B \cos \theta = (30.5) \cos 294 = +12.4$

$B_y = B \sin \theta = (30.5) \sin 294 = -27.9$

$|\vec{B}| = 12.4i - 27.9j$



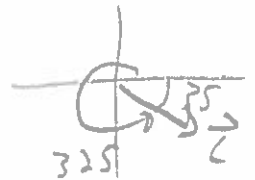
10)  $\vec{A} = 6i - 7j$

$\vec{B} = -12i + 10j$

$\vec{C} = 2(\vec{A} - \vec{B})$

$\theta_C = ?$

$(\vec{A} - \vec{B}) = [6 - (-12)]i + [(-7) - (10)]j$   
 $= 18i + (-17)j$   
 $= 18i - 17j$   
 $2(\vec{A} - \vec{B}) = 36i - 34j = \vec{C}$



$\theta_C = \tan^{-1} \left( \frac{-34}{36} \right) = -35.3^\circ$

$\theta_C = 360 - 35.3 = 324^\circ$

11

