

**QUIZ 1**

Name: Muhammad Taha Roll no. 25F-0755 Date 4<sup>th</sup> Sept, 2025  
 Semester 01 Class BSCS (Applied Physics) Section 1B

9  
10

**Q1.** Carefully examine the short questions below and answer them in concise and clear way. (5)

- a) What does  $\vec{A} \cdot \vec{A}$ , the scalar product with it self, give? What about  $\vec{A} \times \vec{A}$ , the vector product with itself? [2 Marks]

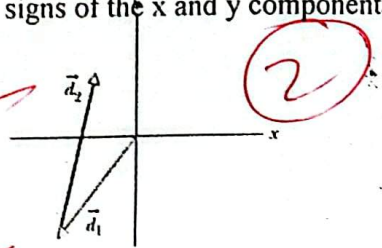
Proof:  $\vec{A} \times \vec{A} = A_1 A_1 \sin 0^\circ \hat{n} = \boxed{\vec{0}}$  ( $\because \sin 0^\circ = 0$ )  
 $\vec{A} \cdot \vec{A} = A^2$  ?

1

- b) The two vectors shown in figure lie in an xy plane. What are the signs of the x and y components, respectively, of (a)  $\vec{d}_1 + \vec{d}_2$  and (b)  $\vec{d}_1 - \vec{d}_2$ ? [2 Marks]

(a)  $\vec{d}_1 + \vec{d}_2$   $\rightarrow$  x-component is negative  
 $\rightarrow$  y-component is positive

(b)  $\vec{d}_1 - \vec{d}_2$   $\rightarrow$  x-component is negative  
 $\rightarrow$  y-component is negative



2

- Solution: c) Find the magnitude and direction of  $(\frac{3}{4}\hat{i} - 2\hat{j})$  [1 Mark]

Let  $\vec{A} = \frac{3}{4}\hat{i} - 2\hat{j}$

now  $|\vec{A}| = \sqrt{A_x^2 + A_y^2} = \sqrt{(\frac{3}{4})^2 + (-2)^2} = \sqrt{\frac{9}{16} + 4} = \sqrt{\frac{9+64}{16}} = \frac{\sqrt{73}}{4} = \boxed{2.136}$  un

$\phi = \tan^{-1}(\frac{-2}{3/4}) = \tan^{-1}(-2.66) = 69.44^\circ$  but  $\theta = 2\pi - \phi = 360^\circ - 69.44^\circ$

$\theta = \boxed{290.55^\circ}$

**Q2:** Two vectors are presented as

$\vec{a} = 3\hat{i} + 5\hat{j}$  and,

$\vec{b} = 2\hat{i} + 4\hat{j}$

Find (a)  $(\vec{a} + \vec{b}) \cdot \vec{b}$ , and (b)  $\vec{a} \times \vec{b}$ . [5 Marks]

Solution:

(a)  $\vec{a} + \vec{b} = 3\hat{i} + 5\hat{j} + 2\hat{i} + 4\hat{j} = 5\hat{i} + 9\hat{j}$

now  $(\vec{a} + \vec{b}) \cdot (\vec{b}) = (5\hat{i} + 9\hat{j}) \cdot (2\hat{i} + 4\hat{j}) = (5)(2) + (9)(4) = 10 + 36 = \boxed{46}$  un

(b)  $\vec{a} \times \vec{b} = (3\hat{i} + 5\hat{j}) \times (2\hat{i} + 4\hat{j}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 5 & 0 \\ 2 & 4 & 0 \end{vmatrix} = \hat{i}(0) - \hat{j}(0) + \hat{k}(12 - 10) = \boxed{2\hat{k}}$

## Quiz Chapter # 03 (Vectors)

### Topics Included:

- ⊙ Addition of Vectors
- ⊙ Components of vectors
- ⊙ Unit Vector
- ⊙ Scalar and Vector Product