

VECTOR ASSIGNMENT

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1 PROBLEM 1

1. Let the vectors \mathbf{a} and \mathbf{b} be such that $\|\mathbf{a}\| = 3$, $\|\mathbf{b}\| = \frac{\sqrt{2}}{3}$, then $\mathbf{a} \times \mathbf{b}$ is a unit vector, if the angle between \mathbf{a} and \mathbf{b} is

1) $\frac{\pi}{6}$

2) $\frac{\pi}{4}$

3) $\frac{\pi}{3}$

4) $\frac{\pi}{2}$

SOLUTION:

$$\mathbf{a} \times \mathbf{b} = \|\mathbf{a}\| \|\mathbf{b}\| \sin \theta = 1 \quad (1.0.1)$$

$$\Rightarrow \sin \theta = \frac{1}{\|\mathbf{a}\| \|\mathbf{b}\|} \quad (1.0.2)$$

$$= \frac{1}{3} \times \frac{3}{\sqrt{2}} \quad (1.0.3)$$

$$= \frac{1}{\sqrt{2}} \quad (1.0.4)$$

$$\Rightarrow \theta = \sin^{-1} \left(\frac{1}{\sqrt{2}} \right) \quad (1.0.5)$$

$$= \frac{\pi}{4} \quad (1.0.6)$$

\therefore Correct option is 2.