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:

$$\mathbf{a} \times \mathbf{b} = \|\mathbf{a}\| \|\mathbf{b}\| \sin\theta = 1 \tag{1.0.1}$$

$$\implies \sin\theta = \frac{1}{\|\mathbf{a}\| \|\mathbf{b}\|} \tag{1.0.2}$$

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

$$= \frac{1}{\sqrt{2}} \tag{1.0.4}$$

$$\implies \theta = \sin^{-1}(\frac{1}{\sqrt{2}}) \tag{1.0.5}$$

$$= \frac{\pi}{4} \tag{1.0.6}$$

$\therefore$ Correct option is 2.