

2.7.8

EE25BTECH11026-Harsha

Question:

Find $|\mathbf{a} - \mathbf{b}|$, if two vectors \mathbf{a} and \mathbf{b} are such that $|\mathbf{a}| = 2, |\mathbf{b}| = 3$ and $\mathbf{a} \cdot \mathbf{b} = 4$.

Solution:

Let us solve the given equation theoretically and then verify the solution computationally.

According to the question,

$$|\mathbf{a}| = 2 ; |\mathbf{b}| = 3 ; \mathbf{a}^T \mathbf{b} = 4 \quad (0.1)$$

The value of $\|\mathbf{a} - \mathbf{b}\|$ can be computed by the following formula,

$$\|\mathbf{a} - \mathbf{b}\|^2 = \|\mathbf{a}\|^2 + \|\mathbf{b}\|^2 - 2\mathbf{a}^T \mathbf{b} \quad (0.2)$$

$$\therefore \|\mathbf{a} - \mathbf{b}\|^2 = 2^2 + 3^2 - 2 \times 4 \quad (0.3)$$

$$\|\mathbf{a} - \mathbf{b}\|^2 = 5 \quad (0.4)$$

$$\Rightarrow \|\mathbf{a} - \mathbf{b}\| = \sqrt{5} = 2.2361 \text{ units} \quad (0.5)$$