2.2.6

AI25BTECH11016-Varun

Question:

Find the angle between the vectors $\mathbf{a} = 2\hat{i} - \hat{j} + \hat{k}, \quad \mathbf{b} = 3\hat{i} + 4\hat{j} - \hat{k}$.

Solution:

$$\mathbf{a} = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}, \tag{1}$$

$$\mathbf{b} = \begin{pmatrix} 3 \\ 4 \\ -1 \end{pmatrix}. \tag{2}$$

From the formula,

$$\cos\theta = \frac{\mathbf{a} \cdot \mathbf{b}}{\|\mathbf{a}\| \, \|\mathbf{b}\|} \tag{3}$$

Substituting,

$$\begin{aligned} \cos\theta &= \frac{1}{\sqrt{6}\ \sqrt{26}} \\ &= \frac{1}{\sqrt{156}}. \end{aligned} \tag{4}$$

Therefore,

$$\theta = \cos^{-1}\left(\frac{1}{\sqrt{156}}\right). \tag{5}$$

The angle between the given two vectors is $\cos^{-1}\left(\frac{1}{\sqrt{156}}\right)$.

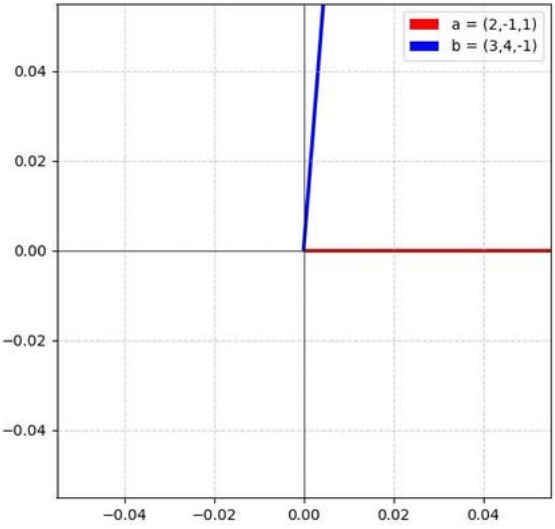

Fig. 0.1