

1.10.17

EE25BTECH11054 - Soma Harsha Vardhan Reddy

Question:

Find the unit vector in the direction of the sum of the vectors, $\mathbf{a} = 2\mathbf{i} + 2\mathbf{j} - 5\mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} + \mathbf{j} + 3\mathbf{k}$

Solution:

Given the vectors \mathbf{a} and \mathbf{b}

$$\mathbf{a} = \begin{pmatrix} 2 \\ 2 \\ -5 \end{pmatrix}, \mathbf{b} = \begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix} \quad (0.1)$$

$$\mathbf{P} = \mathbf{a} + \mathbf{b} \quad (0.2)$$

$$\mathbf{P} = \begin{pmatrix} 4 \\ 3 \\ -2 \end{pmatrix} \quad (0.3)$$

The formula for finding unit vector along a given vector we use

$$\mathbf{p} = \frac{\mathbf{P}}{\|\mathbf{P}\|} \quad (0.4)$$

$$\|\mathbf{P}\|^2 = \mathbf{P}\mathbf{P}^T = \begin{pmatrix} 4 \\ 3 \\ -2 \end{pmatrix} \begin{pmatrix} 4 & 3 & -2 \end{pmatrix} = 29 \quad (0.5)$$

$$\mathbf{p} = \frac{1}{\sqrt{29}} \begin{pmatrix} 4 \\ 3 \\ -2 \end{pmatrix} \quad (0.6)$$

$$\mathbf{p} = \begin{pmatrix} \frac{4}{\sqrt{29}} \\ \frac{3}{\sqrt{29}} \\ \frac{-2}{\sqrt{29}} \end{pmatrix} \quad (0.7)$$

