

1.10.11

EE25BTECH11053 - Surya Sri

Question:

Find a vector of magnitude 5 units, and parallel to the resultant of the vectors $\mathbf{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\mathbf{b} = \hat{i} - 2\hat{j} + \hat{k}$.

Solution:

Let the required vector be \mathbf{R} ,

$$\mathbf{R} = k \frac{\mathbf{a} + \mathbf{b}}{\|\mathbf{a} + \mathbf{b}\|} \quad (1)$$

According to the question $k = 5$,

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

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

$$\mathbf{a} + \mathbf{b} = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} \quad (4)$$

So,

$$\mathbf{p} = 5 \frac{\begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}}{\sqrt{3^2 + 1^2 + 0^2}} = \frac{5}{\sqrt{10}} \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} \quad (5)$$

$$\boxed{\mathbf{p} = \frac{5}{\sqrt{10}} \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}} \quad (6)$$

3D Plot: Vectors a, b, and Resultant Parallel of Mag 5

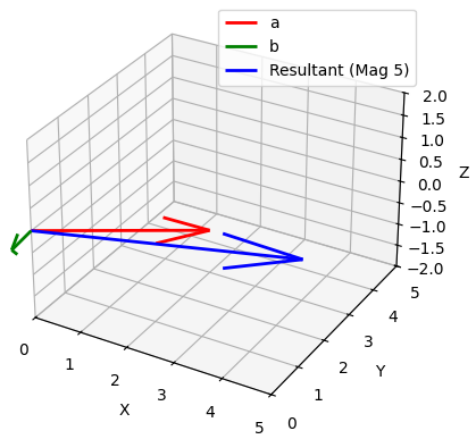


Fig. 0