

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} ,

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

Magnitude of Resultant vector is,

$$\|\mathbf{R}\| = \sqrt{3^2 + 1^2 + 0^2} = \sqrt{9 + 1} = \sqrt{10} \quad (2)$$

Let the desired vector be,

$$\|k\mathbf{R}\| = 5 \quad (3)$$

$$|k| \sqrt{10} = 5 \quad (4)$$

$$\Rightarrow k = \frac{5}{\sqrt{10}} \quad (5)$$

$$\mathbf{a} = \begin{pmatrix} 2 \\ 3 \\ -1 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix} \quad (6)$$

$$\mathbf{a} + \mathbf{b} = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} \quad (7)$$

$$\boxed{\mathbf{R} = \frac{5}{\sqrt{10}} \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}} \quad (8)$$

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

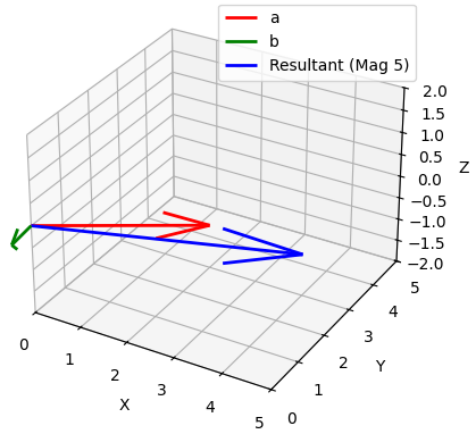


Fig. 0