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 $\mathbf{b}$

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

$$\mathbf{P} = \mathbf{a} + \mathbf{b} \tag{0.2}$$

$$\mathbf{P} = \begin{pmatrix} 4 \\ 3 \\ -2 \end{pmatrix} \tag{0.3}$$

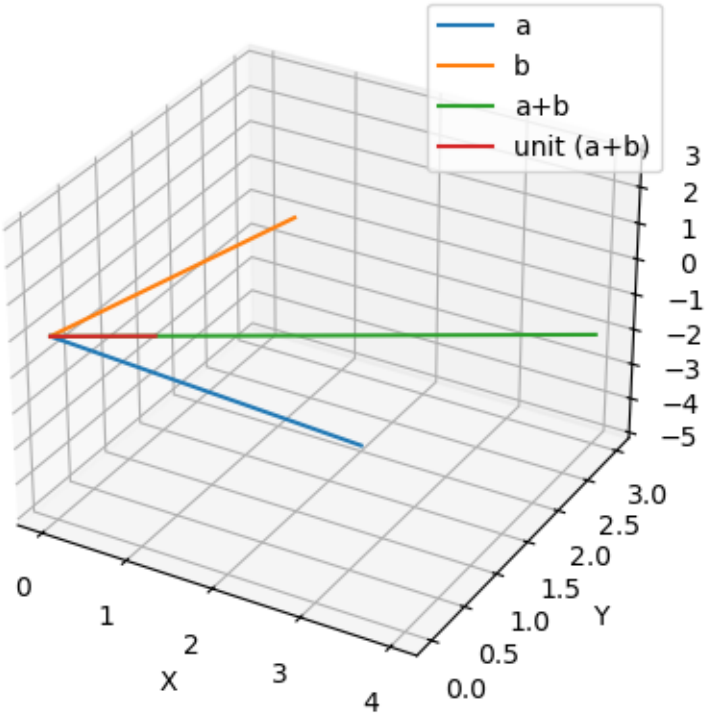
The formula for finding unit vector along a given vector we use

$$\mathbf{p} = \frac{\mathbf{P}}{\|\mathbf{P}\|} \tag{0.4}$$

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

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

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


a
b
a+b
unit (a+b)
X
Y
0
1
2
3
4
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3
2
1
0
−1
−2
−3
−4
−5