

2.9.13

EE25BTECH11062 - Vivek K Kumar

Question:

If **A**, **B** and **C** are the position vectors of the points **A**(2, 3, -4), **B**(3, -4, -5) and **C**(3, 2, -3) respectively, then $\|\mathbf{A} + \mathbf{B} + \mathbf{C}\|$ is equal to:

Solution:

Name	Point
A	$\begin{pmatrix} 2 \\ 3 \\ -4 \end{pmatrix}$
B	$\begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}$
C	$\begin{pmatrix} 3 \\ 2 \\ -3 \end{pmatrix}$

TABLE 0: Variables Used

Finding $\mathbf{A} + \mathbf{B} + \mathbf{C}$,

$$\mathbf{A} + \mathbf{B} + \mathbf{C} = \begin{pmatrix} 2 \\ 3 \\ -4 \end{pmatrix} + \begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \\ -3 \end{pmatrix} \quad (0.1)$$

$$= \begin{pmatrix} 8 \\ 1 \\ -12 \end{pmatrix} \quad (0.2)$$

Now finding $\|\mathbf{A} + \mathbf{B} + \mathbf{C}\|$,

$$\|\mathbf{A} + \mathbf{B} + \mathbf{C}\|^2 = (\mathbf{A} + \mathbf{B} + \mathbf{C})^\top (\mathbf{A} + \mathbf{B} + \mathbf{C}) \quad (0.3)$$

$$= \begin{pmatrix} 8 & 1 & -12 \end{pmatrix} \begin{pmatrix} 8 \\ 1 \\ -12 \end{pmatrix} \quad (0.4)$$

$$= 8^2 + 1^2 + (-12)^2 \quad (0.5)$$

$$= 209 \quad (0.6)$$

Hence,

$$\|\mathbf{A} + \mathbf{B} + \mathbf{C}\| = \sqrt{209} \quad (0.7)$$

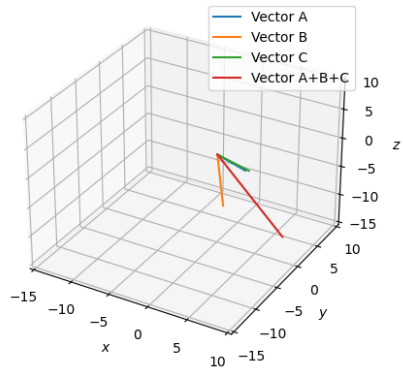


Fig. 0.1: Vectors **A**, **B**, **C** and **A + B + C**