1-1.10-10

EE24BTECH11005 - Arjun Pavanje

Question:

The vector in the direction of the vector $\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$ that has magnitude 9 is

1) $\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$

2) $\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$

3) $3\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$

4) $9\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$

Variable	Description
A	$\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$ vector

TABLE I: Variables Used

Solution: Unit vector in the direction of **A** is

$$\frac{A}{\|A\|} \tag{1}$$

$$\|A\| = A^T A \tag{2}$$

$$= \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} \begin{pmatrix} 1 & -2 & 2 \end{pmatrix} \tag{3}$$

$$= \sqrt{9} = 3 \tag{4}$$

$\therefore$ the vector in the direction of **A**, with 9 times its magnitude is

$$9\frac{A}{\|A\|} = 9\frac{\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}}{3} \tag{5}$$

$$= 3\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} \tag{6}$$

so, 3) = $3\begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$ is the required vector

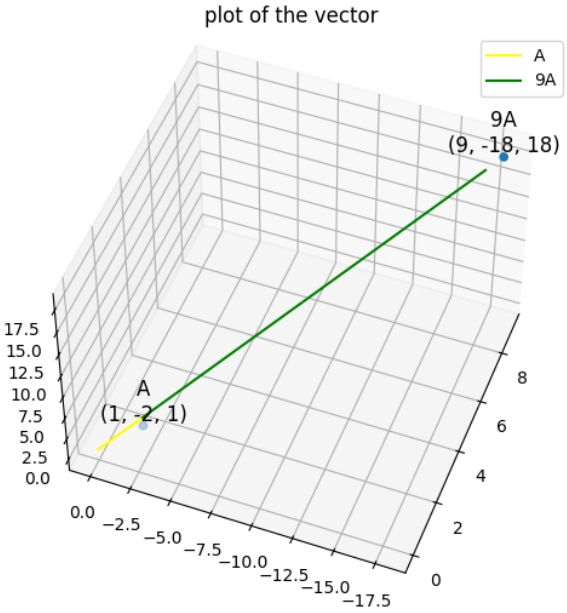

Fig. 1: Plot of the vectors