

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) $\begin{pmatrix} 1 \\ -2 \\ 0 \end{pmatrix}$

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

$$\frac{\mathbf{A}}{\|\mathbf{A}\|} \quad (1)$$

$$\|\mathbf{A}\| = \mathbf{A}^T \mathbf{A} \quad (2)$$

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

$$= \sqrt{9} = 3 \quad (4)$$

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

$$9 \frac{\mathbf{A}}{\|\mathbf{A}\|} = 9 \frac{\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}}{3} \quad (5)$$

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

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

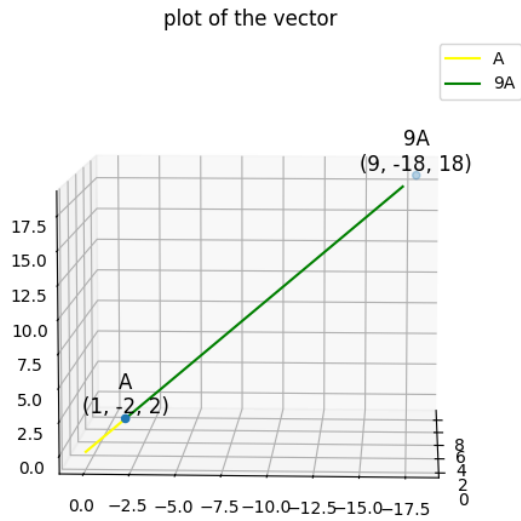


Fig. 1: Plot of the vectors