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
Q	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$ point
P	$\begin{pmatrix} 5 \\ -3 \end{pmatrix}$ point
R	$\begin{pmatrix} x \\ 6 \end{pmatrix}$ point
x	value to be found

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 $\mathbf{A}$, 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

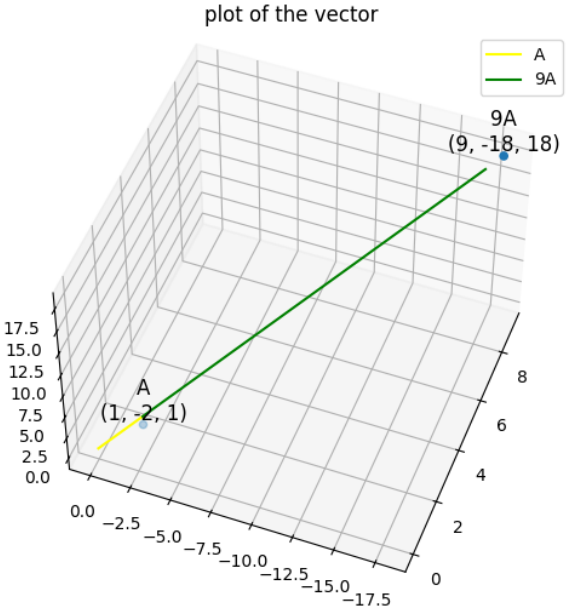

Fig. 1: Plot of P,Q,R