

1-1.8-18

AI24BTECH11012 - Pushkar Gudla

Question: If the distance between the points $\begin{pmatrix} 4 \\ p \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$ is 5, then the value of p is
Solution:

Variable	Description
A	$\begin{pmatrix} 4 \\ p \end{pmatrix}$
B	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$
D	A – B

TABLE 0: Variables Used

$$\mathbf{D} = \begin{pmatrix} 3 \\ p \end{pmatrix} \quad (0.1)$$

$$\|\mathbf{D}\|^2 = \mathbf{D}\mathbf{D}^\top \quad (0.2)$$

$$\|\mathbf{D}\|^2 = \begin{pmatrix} 3 \\ p \end{pmatrix} \begin{pmatrix} 3 & p \end{pmatrix} \quad (0.3)$$

$$\|\mathbf{D}\|^2 = 3^2 + p^2 \quad (0.4)$$

$$\implies \|\mathbf{D}\|^2 = 9 + p^2 \quad (0.5)$$

It has been given that the distance between the two points is 5, so

$$\|\mathbf{D}\|^2 = 25 \quad (0.6)$$

$$\implies 25 = 9 + p^2 \quad (0.7)$$

$$\implies p = \pm 4 \quad (0.8)$$

