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

$$\mathbf{D} = \begin{pmatrix}3\\p\end{pmatrix} \tag{0.1}$$

$$\|\mathbf{D}\|^2 = \mathbf{D}\mathbf{D}^\top \tag{0.2}$$

$$\implies \|\mathbf{D}\|^2 = \begin{pmatrix}3\\p\end{pmatrix}\begin{pmatrix}3 & p\end{pmatrix} \tag{0.3}$$

$$\implies \|\mathbf{D}\|^2 = 3^2 + p^2 \tag{0.4}$$

$$\implies \|\mathbf{D}\|^2 = 9 + p^2 \tag{0.5}$$

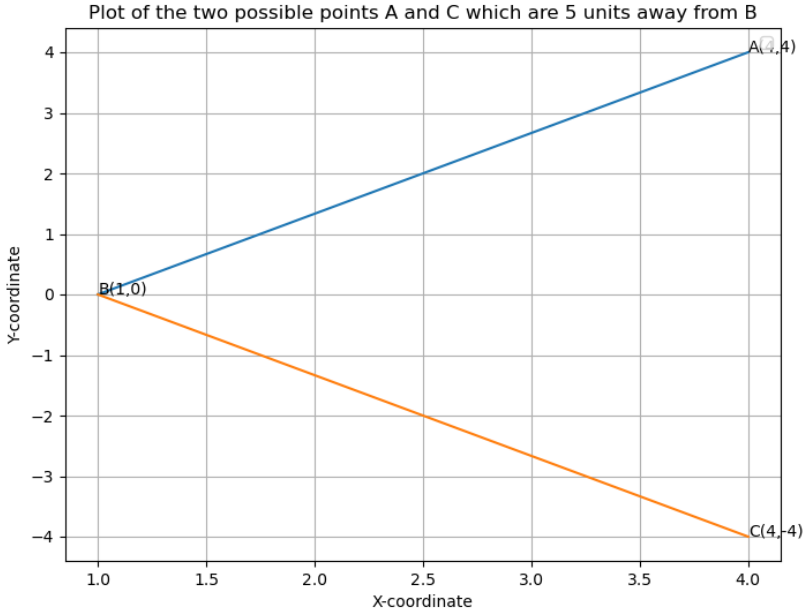
$$\tag{0.6}$$

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

$$\|\mathbf{D}\|^2 = 25 \tag{0.7}$$

$$\implies 25 = 9 + p^2 \tag{0.8}$$

$$\implies p = \pm 4 \tag{0.9}$$


Plot of the two possible points A and C which are 5 units away from B
A(4,4)
B(1,0)
C(4,-4)
Y-coordinate
X-coordinate
4
3
2
1
0
−1
−2
−3
−4
1.0
1.5
2.0
2.5
3.0
3.5
4.0