1-1.9-22

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VECTOR ARITHMETIC(CBSE)

Question(1.9.22)Find the value of y for which the distance between the points **P** $(2, -3)$ and **Q** $(10, y)$ is 10 units.
We have the points

Parameter	Description
P	$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$
Q	$\begin{pmatrix} 10 \\ y \end{pmatrix}$
D	**Q** − **P**

TABLE 0: Variables Used

$$\mathbf{D} = \begin{pmatrix} 8 \\ y+3 \end{pmatrix} \tag{0.1}$$

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

$$\|\mathbf{D}\|^2 = \begin{pmatrix} 8 \\ y+3 \end{pmatrix} \begin{pmatrix} 8 & y+3 \end{pmatrix} \tag{0.3}$$

$$\|\mathbf{D}\|^2 = 8^2 + (y+3)^2 \tag{0.4}$$

$$\tag{0.5}$$

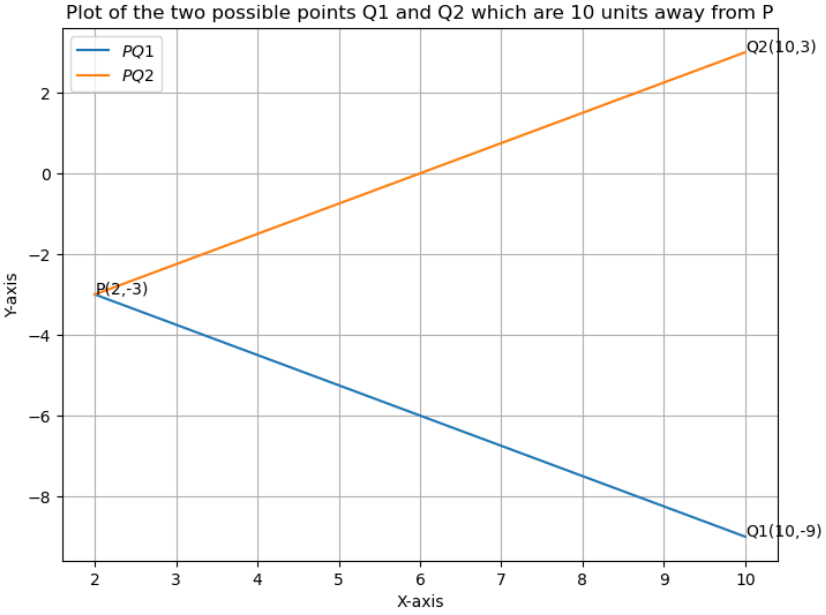
It has been given that the distance between the points is 10 units, so
Solution:

$$\|\mathbf{D}\|^2 = 100 \tag{0.6}$$

$$100 = 73 + y^2 + 6y \tag{0.7}$$

$$\therefore y = 3, -9 \tag{0.8}$$

$$\tag{0.9}$$


Plot of the two possible points Q1 and Q2 which are 10 units away from P
PQ1
PQ2
Q2(10,3)
P(2,-3)
Q1(10,-9)
Y-axis
X-axis
2
0
−2
−4
−6
−8
2
3
4
5
6
7
8
9
10