

CHAPTER-7
COORDINATE GEOMETRY

Excercise 7.1.

Q8.Find the Value of y for which the distance between the points P(2,-3) and Q(10,y) is 10 units:

1. $(2, -3), (10, y)$

Solution:

1. The coordinates are given as

$$\mathbf{P} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}, \mathbf{Q} = \begin{pmatrix} 10 \\ y \end{pmatrix}, \quad (1)$$

$$\mathbf{P} - \mathbf{Q} = \begin{pmatrix} 2 \\ -3 \end{pmatrix} - \begin{pmatrix} 10 \\ y \end{pmatrix} = \begin{pmatrix} -8 \\ -3 - y \end{pmatrix} \quad (2)$$

$$(3)$$

$$(\mathbf{P} - \mathbf{Q})^\top (\mathbf{P} - \mathbf{Q}) = \begin{pmatrix} -8 & -3 - y \end{pmatrix} \begin{pmatrix} -8 \\ -3 - y \end{pmatrix} = y^2 + 6y + 9 + 64 \quad (4)$$

$$d = \|\mathbf{P} - \mathbf{Q}\| = \sqrt{(\mathbf{P} - \mathbf{Q})^\top (\mathbf{P} - \mathbf{Q})} \quad (5)$$

Given, d=10 units, therefore;

$$10 = \sqrt{y^2 + 6y + 9 + 64} \quad (6)$$

Removing root on Right Hand Side(RHS)

Squaring on Both Sides

$$\begin{aligned}
& (y^2 + 6y + 73) = 100 \\
\Rightarrow & (y^2 + 6y + 73 - 100) = 0 \\
\Rightarrow & (y^2 + 6y - 27) = 0 \\
\Rightarrow & ((y - 3)(y + 9)) = 0
\end{aligned} \tag{7}$$

Hence, the value of y for given point $P(2,-3)$ and $Q(10,y)$ is $y = 3$.

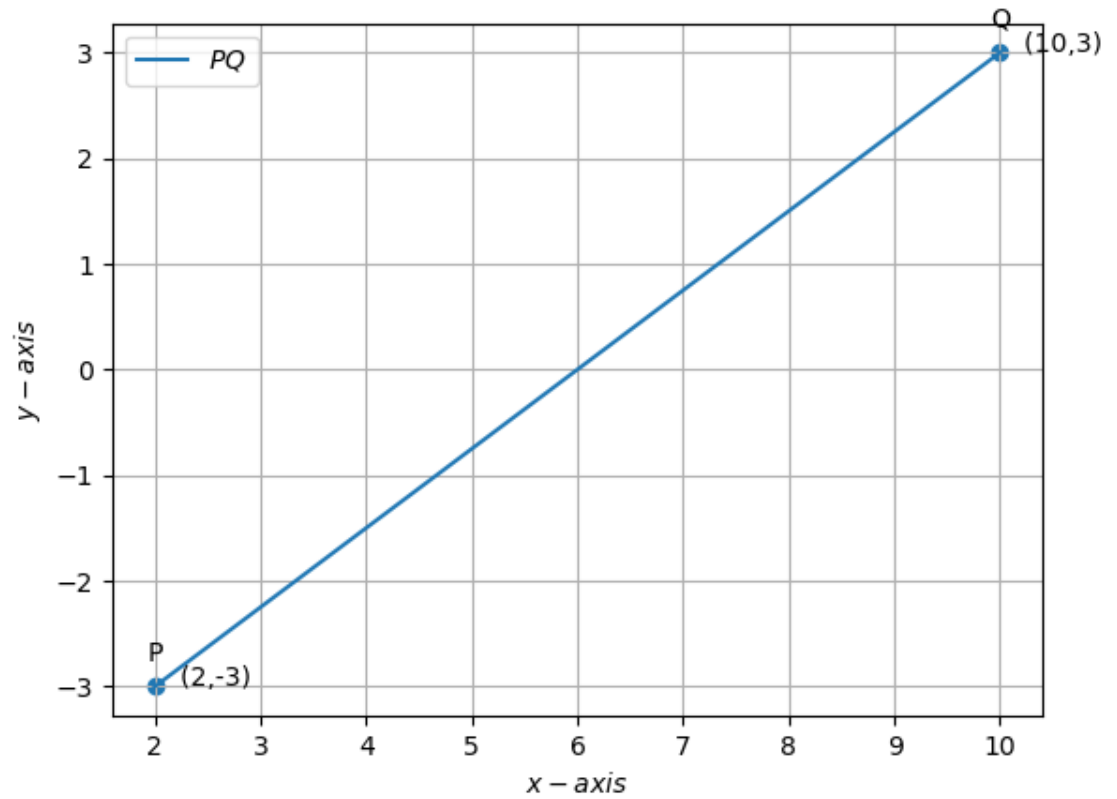


Figure 1: Graph for the line