

1.9.33

EE25BTECH11045 - P.Navya Priya

Question: If $\mathbf{Q}(0, 1)$ is equidistant from $\mathbf{P}(5, -3)$ and $\mathbf{R}(x, 6)$. Find the value of x .

Solution:

\mathbf{P}	$\begin{pmatrix} 5 \\ -3 \end{pmatrix}$
\mathbf{Q}	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$
\mathbf{R}	$\begin{pmatrix} x \\ 6 \end{pmatrix}$

Since \mathbf{Q} is equidistant from \mathbf{P} and \mathbf{R} ,

$$\|(\mathbf{Q} - \mathbf{P})\| = \|(\mathbf{Q} - \mathbf{R})\| \quad (1)$$

$$\|(\mathbf{Q} - \mathbf{P})\|^2 = \|(\mathbf{Q} - \mathbf{R})\|^2 \quad (2)$$

$$\|\mathbf{Q}\|^2 - 2\mathbf{Q}^\top \mathbf{P} + \|\mathbf{P}\|^2 = \|\mathbf{Q}\|^2 - 2\mathbf{Q}^\top \mathbf{R} + \|\mathbf{R}\|^2 \quad (3)$$

$$(\mathbf{P} - \mathbf{R})^\top \mathbf{Q} = \frac{\|\mathbf{P}\|^2 - \|\mathbf{R}\|^2}{2} \quad (4)$$

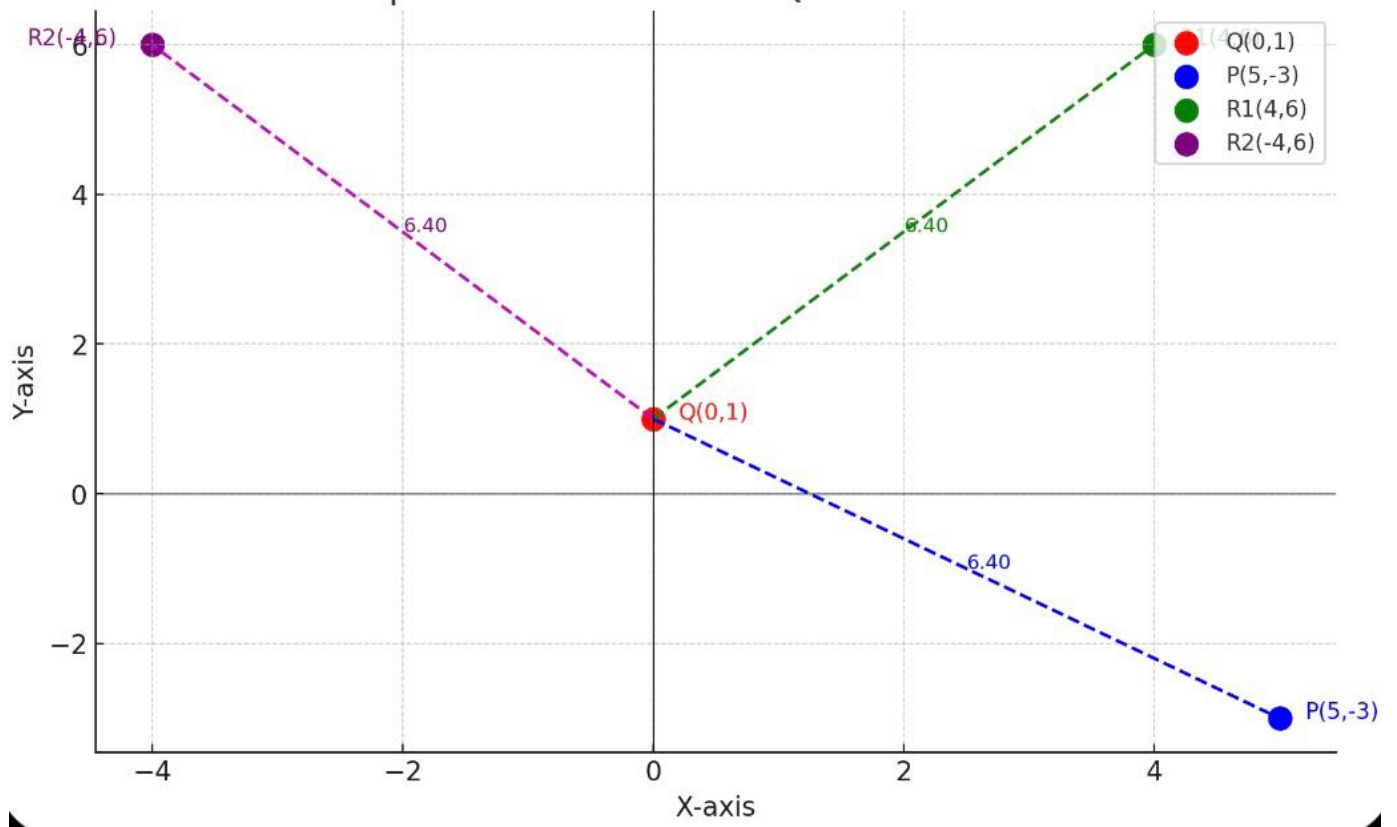
After substituting the values,

$$\begin{pmatrix} 5 - x \\ -9 \end{pmatrix}^\top \begin{pmatrix} 0 \\ 1 \end{pmatrix} = \frac{34 - x^2 - 36}{2} \quad (5)$$

$$-18 = -2 - x^2 \quad (6)$$

Therefore,

$$x = \pm 4 \quad (7)$$



Equidistant Points from **Q** with Distances