

1-1.9-24

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Question:

The x -coordinate of a point \mathbf{P} twice its y -coordinate. If \mathbf{P} is equidistant from the points $\mathbf{Q}(2 \ -5)$ and $\mathbf{R}(-3 \ 6)$, find the coordinates of \mathbf{P} .

Solution:

Variable	Description
\mathbf{P}	$(2a \ a)$ point
\mathbf{Q}	$(2 \ -5)$ point
\mathbf{R}	$(-3 \ 6)$ point
\mathbf{a}	y -coordinate of \mathbf{P}

TABLE 0: Variables Used

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

$$\|P - Q\| = \|P - R\| \quad (0.1)$$

$$\sqrt{(P - Q)^T (P - Q)} = \sqrt{(P - R)^T (P - R)} \quad (0.2)$$

$$(P - Q) = \begin{pmatrix} 2a - 2 \\ a + 5 \end{pmatrix}, (P - R) = \begin{pmatrix} 2a + 3 \\ a - 6 \end{pmatrix}$$

Putting values into equation 0.2 and squaring,

$$(2a - 2)^2 + (a + 5)^2 = (2a + 3)^2 + (a - 6)^2 \quad (0.3)$$

$$a = 8 \quad (0.4)$$

So,

$$\mathbf{P} = \begin{pmatrix} 16 \\ 8 \end{pmatrix}$$

