1-1.8-10

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Question:

If $\mathbf{Q}(0, 1)$ is equidistant from $\mathbf{P}(5, -3)$ and $\mathbf{R}(x, 6)$, find the values of x.Also find the distances QR and PR.

Solution:

point	Description
P	$(5, -3)$
Q	$(0, 1)$
R	$(x, 6)$

TABLE 0: Variables Used

$$PQ = QR \tag{0.1}$$

$$\sqrt{(\mathbf{P} - \mathbf{Q})^\top (\mathbf{P} - \mathbf{Q})} = \sqrt{(\mathbf{Q} - \mathbf{R})^\top (\mathbf{Q} - \mathbf{R})} \tag{0.2}$$

$$\mathbf{P} - \mathbf{Q} = \begin{pmatrix} 5 \\ -4 \end{pmatrix} \tag{0.3}$$

$$\mathbf{Q} - \mathbf{R} = \begin{pmatrix} -x \\ -5 \end{pmatrix} \tag{0.4}$$

$$\sqrt{41} = \sqrt{x^2 + 25} \tag{0.5}$$

on comparing both sides,

$$x = \pm 4 \tag{0.6}$$

$$QR = \sqrt{(\mathbf{Q} - \mathbf{R})^\top (\mathbf{Q} - \mathbf{R})} \tag{0.7}$$

$$QR = \sqrt{41} \tag{0.8}$$

$$PR = \sqrt{(\mathbf{P} - \mathbf{R})^\top (\mathbf{P} - \mathbf{R})} \tag{0.9}$$

if $x = 4$,

$$PR = \sqrt{82} \tag{0.10}$$

if $x = -4$,

$$PR = \sqrt{162} \qquad (0.11)$$

Q is Equidistant from P and R