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

$$PQ = QR \tag{0.1}$$
(0.2)

$$\sqrt{(\mathbf{P}-\mathbf{Q})^{\top}(\mathbf{P}-\mathbf{Q})} = \sqrt{(\mathbf{Q}-\mathbf{R})^{\top}(\mathbf{Q}-\mathbf{R})} \tag{0.3}$$
(0.4)

$$\mathbf{P}-\mathbf{Q} = \begin{pmatrix} 5 \\ -4 \end{pmatrix} \tag{0.5}$$
$$\mathbf{Q}-\mathbf{R} = \begin{pmatrix} -x \\ -5 \end{pmatrix} \tag{0.6}$$
(0.7)

$$\sqrt{41} = \sqrt{x^2+25} \tag{0.8}$$
(0.9)

on comparing both sides,

$$x = \pm 4 \tag{0.10}$$
(0.11)

$$QR = \sqrt{(\mathbf{Q}-\mathbf{R})^{\top}(\mathbf{Q}-\mathbf{R})} \tag{0.12}$$
(0.13)

$$QR = \sqrt{41} \tag{0.14}$$

(0.15)

$$PR = \sqrt{(\mathbf{P} - \mathbf{R})^{\top} (\mathbf{P} - \mathbf{R})} \tag{0.16}$$

(0.17)

if $x = 4$,

$$PR = \sqrt{82} \tag{0.18}$$

(0.19)

if $x = -4$,

$$PR = \sqrt{162} \tag{0.20}$$

(0.21)