Assignment4

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Question

Given the vertices of a triangle PQR as P$(2, 2)$, Q$(-4, -4)$, and R$(5, -8)$, find the length of the median through R.

Solution

Input	Output
P	$\mathrm{P} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$
Q	$\mathrm{Q} = \begin{pmatrix} -4 \\ -4 \end{pmatrix}$
R	$\mathrm{R} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}$
M	Midpoint of P,Q

The midpoint M of the line segment PQ is calculated as:

$$M = \frac{P + Q}{2}$$

$$\mathbf{R} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}, \quad \mathbf{M} = \begin{pmatrix} -1 \\ -1 \end{pmatrix}$$

$$\mathbf{RM} = \mathbf{R} - \mathbf{M} = \begin{pmatrix} 5 \\ -8 \end{pmatrix} - \begin{pmatrix} -1 \\ -1 \end{pmatrix}$$

$$= \begin{pmatrix} 5 - (-1) \\ -8 - (-1) \end{pmatrix} = \begin{pmatrix} 6 \\ -7 \end{pmatrix}$$

$$\|\mathbf{RM}\|_2 = \sqrt{(\mathbf{RM})^T \mathbf{RM}} = \sqrt{\begin{bmatrix} 6 & -7 \end{bmatrix} \begin{bmatrix} 6 \\ -7 \end{bmatrix}} = \sqrt{6^2 + (-7)^2} = \sqrt{85}$$

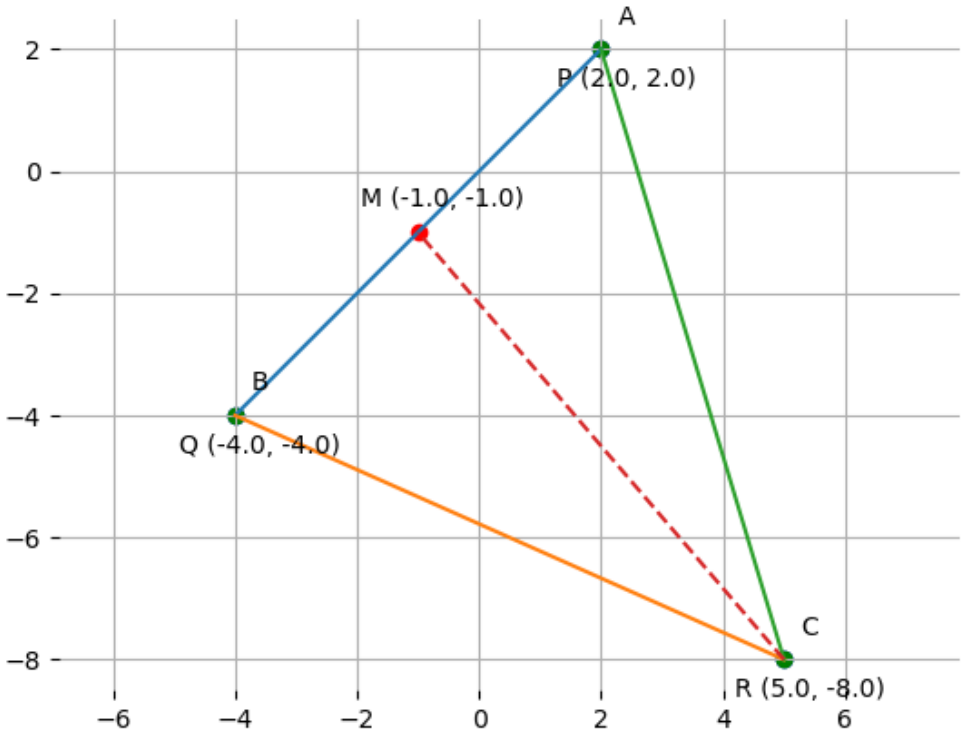

Fig. 0.1: The plot of the points