1.9.14

EE25BTECH11025 - Ganachari Vishwambhar

Question:
If $\mathbf{P} = (2, 2)$, $\mathbf{Q} = (-4, -4)$, and $\mathbf{R} = (5, -8)$ are the vertices of a triangle ΔPQR, then find the length of the median through $\mathbf{R}$.

Solution:
Given position vectors of the points are:

$$\mathbf{P} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}, \mathbf{Q} = \begin{pmatrix} -4 \\ -4 \end{pmatrix}, \mathbf{R} = \begin{pmatrix} 5 \\ -8 \end{pmatrix} \tag{1}$$

Let the midpoint of vector $\mathbf{Q} - \mathbf{P}$ be $\mathbf{M}$:

$$\mathbf{M} = \frac{1}{2}\mathbf{P} + \frac{1}{2}\mathbf{Q} \tag{2}$$

$$\mathbf{M} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} + \begin{pmatrix} -2 \\ -2 \end{pmatrix} \tag{3}$$

$$\mathbf{M} = \begin{pmatrix} -1 \\ -1 \end{pmatrix} \tag{4}$$

Then the median is:

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

$$\mathbf{M} - \mathbf{R} = \begin{pmatrix} -6 \\ 7 \end{pmatrix} \tag{6}$$

The length of the median:

$$\|\mathbf{M} - \mathbf{R}\| = \sqrt{(-6)^2 + (7)^2} \tag{7}$$

$$\|\mathbf{M} - \mathbf{R}\| = \sqrt{85} \approx 9.219 \tag{8}$$

Thus the length of the median of the triangle through $\mathbf{R}$ is $\sqrt{85} \approx 9.219$.

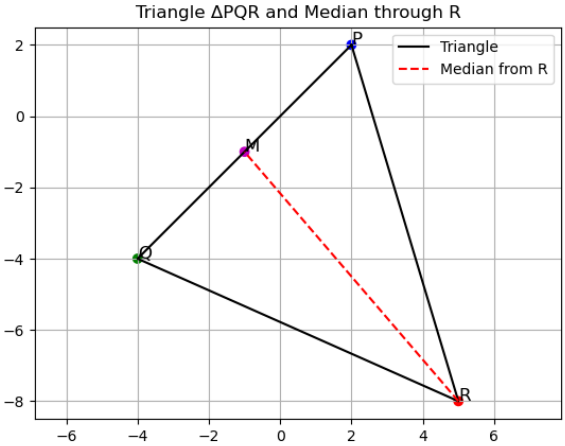

Fig. 1: Plot of line segment **AB**