

Assignment3

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Problem: A line intersects the Y-axis and the X-axis at the points $P(0, b)$ and $Q(c, 0)$ respectively. If $(2, -5)$ is the midpoint of PQ , then find the coordinates of P and Q .

Solution:

Let the coordinates of points P and Q be represented by the vectors:

$$\mathbf{P} = \begin{pmatrix} 0 \\ b \end{pmatrix}, \quad \mathbf{Q} = \begin{pmatrix} c \\ 0 \end{pmatrix}$$

The midpoint M is given as:

$$\mathbf{M} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$$

The midpoint formula in vector form is:

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

Substituting the given values:

$$\frac{1}{2} \left(\begin{pmatrix} 0 \\ b \end{pmatrix} + \begin{pmatrix} c \\ 0 \end{pmatrix} \right) = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$$

This simplifies to:

$$\frac{1}{2} \begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$$

Multiplying both sides by 2:

$$\begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 4 \\ -10 \end{pmatrix}$$

Thus, the coordinates of P and Q are:

$$\mathbf{P} = \begin{pmatrix} 0 \\ -10 \end{pmatrix}, \quad \mathbf{Q} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$$

$$\mathbf{P} = \begin{pmatrix} 0 \\ b \end{pmatrix}, \quad \mathbf{Q} = \begin{pmatrix} c \\ 0 \end{pmatrix} \quad (0.1)$$

$$\mathbf{M} = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \quad (0.2)$$

$$\mathbf{M} = \frac{1}{2}(\mathbf{P} + \mathbf{Q}) \quad (0.3)$$

$$\frac{1}{2} \left(\begin{pmatrix} 0 \\ b \end{pmatrix} + \begin{pmatrix} c \\ 0 \end{pmatrix} \right) = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \quad (0.4)$$

$$\frac{1}{2} \begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \quad (0.5)$$

$$\begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 4 \\ -10 \end{pmatrix} \quad (0.6)$$

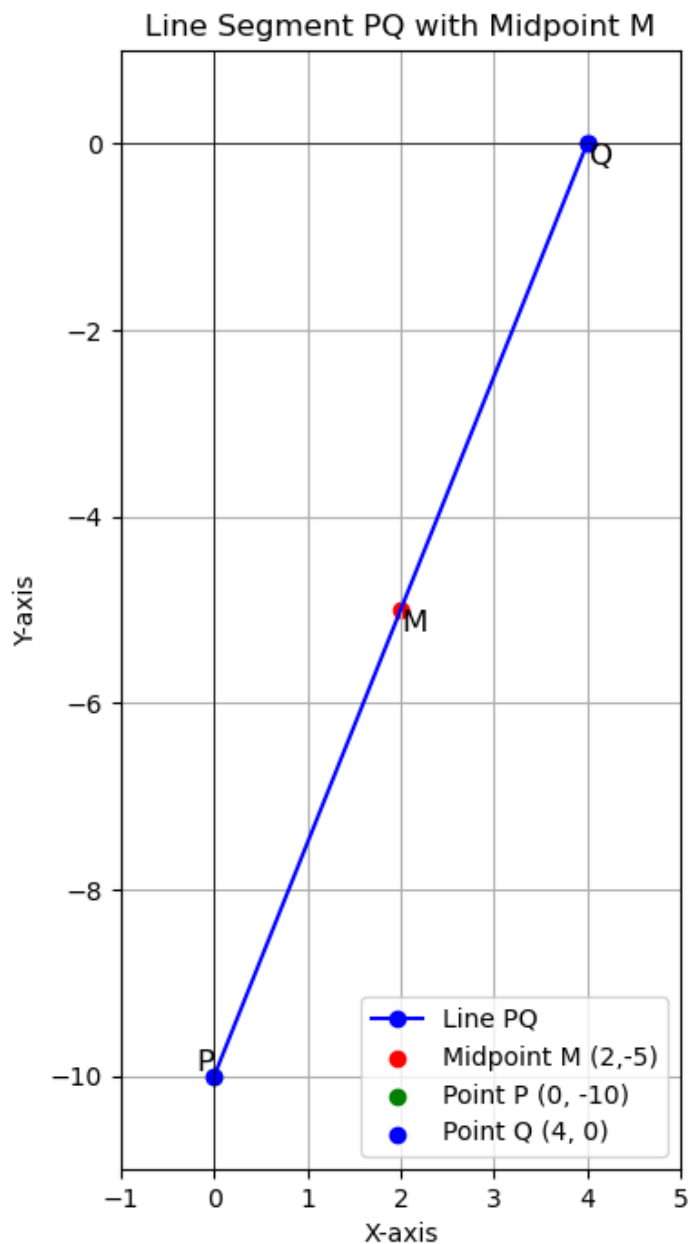


Fig. 0.1: The plot of the points