

# 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  $Q$ .

Input	Output
P	$\mathbf{P} = \begin{pmatrix} 0 \\ b \end{pmatrix}$
Q	$\mathbf{Q} = \begin{pmatrix} c \\ 0 \end{pmatrix}$
M	$\mathbf{M} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$

**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:

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

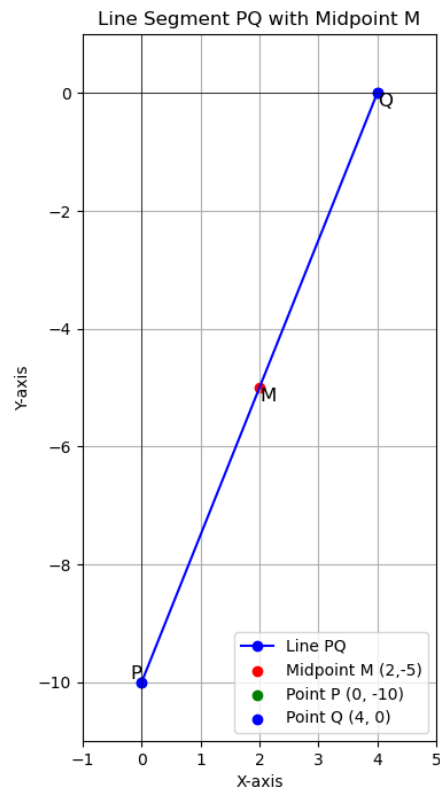


Figure 1: The plot of the points