

1.5.16

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Question: Find the point A if AB is a diameter of the circle with center $C = (3, -1)$ and point $B = (2, 6)$.

Solution:

Point	Vector
B	$\begin{pmatrix} 2 \\ 6 \end{pmatrix}$
C	$\begin{pmatrix} 3 \\ -1 \end{pmatrix}$

Section Formula:

If a point P divides the line joining A and B internally in the ratio $m : n$, then

$$\mathbf{P} = \frac{k\mathbf{B} + \mathbf{A}}{k + 1} = (\mathbf{A} \quad \mathbf{B}) \begin{pmatrix} \frac{1}{k+1} \\ \frac{k}{k+1} \end{pmatrix}. \quad (1)$$

Here, C is the midpoint of AB , i.e. ratio $1 : 1$.

$$\mathbf{C} = \frac{\mathbf{A} + \mathbf{B}}{2} = (\mathbf{A} \quad \mathbf{B}) \begin{pmatrix} \frac{1}{2} \\ \frac{1}{2} \end{pmatrix}. \quad (2)$$

Express \mathbf{A} in terms of \mathbf{B} and \mathbf{C} :

$$\mathbf{C} = \frac{\mathbf{A} + \mathbf{B}}{2} \Rightarrow 2\mathbf{C} = \mathbf{A} + \mathbf{B} \Rightarrow \mathbf{A} = 2\mathbf{C} - \mathbf{B}. \quad (3)$$

Using matrix notation:

$$\mathbf{A} = 2\mathbf{C} - \mathbf{B} = (\mathbf{B} \quad \mathbf{C}) \begin{pmatrix} -1 \\ 2 \end{pmatrix}. \quad (4)$$

Substitute values:

Given:

$$\mathbf{B} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$$

we have,

$$\mathbf{A} = 2 \begin{pmatrix} 3 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ 6 \end{pmatrix} = \begin{pmatrix} 6 \\ -2 \end{pmatrix} - \begin{pmatrix} 2 \\ 6 \end{pmatrix} = \begin{pmatrix} 4 \\ -8 \end{pmatrix}. \quad (5)$$

$$\mathbf{A} = \begin{pmatrix} 4 \\ -8 \end{pmatrix}$$

(6)

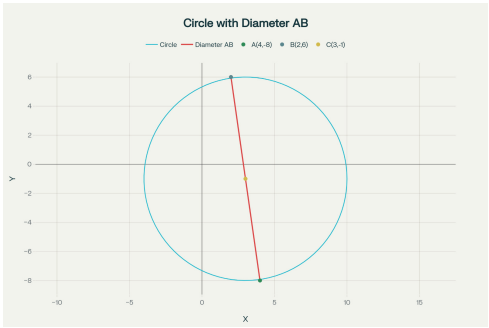


Fig. 0