1.5.7

EE25BTECH11019 - Darji Vivek M.

Question:
If $\left(\frac{a}{3}, 4\right)$ is the midpoint of the line segment joining the points $(-6, 5)$ and $(-2, 3)$, then the value of a is $(10, 2021)$

Solution:

Variable	Description
A	First endpoint $(-6, 5)$
B	Second endpoint $(-2, 3)$
M	Midpoint of **A** and **B**
a	Unknown variable to be determined

TABLE 0: Variables Used

$$\mathbf{A} = \begin{pmatrix} -6 \\ 5 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} -2 \\ 3 \end{pmatrix} \tag{1}$$

The midpoint formula is

$$\mathbf{M} = \frac{\mathbf{A} + \mathbf{B}}{2} \tag{2}$$

Substituting values,

$$\mathbf{M} = \frac{1}{2}\left(\begin{pmatrix} -6 \\ 5 \end{pmatrix} + \begin{pmatrix} -2 \\ 3 \end{pmatrix}\right) = \frac{1}{2}\begin{pmatrix} -8 \\ 8 \end{pmatrix} = \begin{pmatrix} -4 \\ 4 \end{pmatrix} \tag{3}$$

But given midpoint is

$$\mathbf{M} = \begin{pmatrix} \frac{a}{3} \\ 4 \end{pmatrix} \tag{4}$$

Equating first components,

$$\frac{a}{3} = -4 \implies a = -12 \tag{5}$$

Hence, the value of a is $\boxed{-12}$

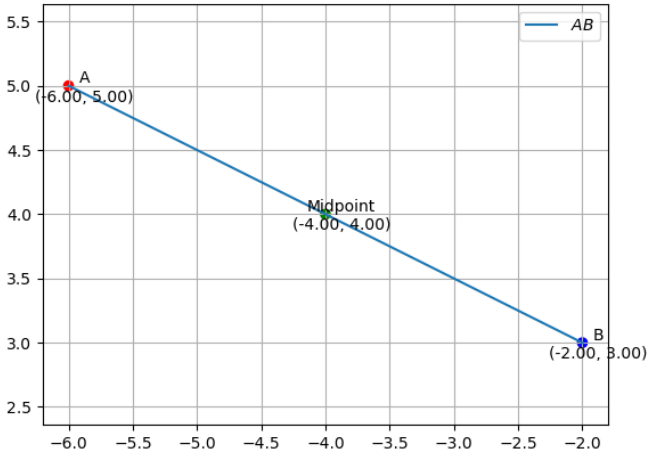
AB
A
(-6.00, 5.00)
Midpoint
(-4.00, 4.00)
B
(-2.00, 3.00)
5.5
5.0
4.5
4.0
3.5
3.0
2.5
−6.0
−5.5
−5.0
−4.5
−4.0
−3.5
−3.0
−2.5
−2.0

Fig. 0.1: plot