1.5.21

EE25BTECH11033 - Kavin

Question:
Find the ratio in which $\mathbf{P}(4, m)$ divides the line segment joining the points $\mathbf{A}(2, 3)$ and $\mathbf{B}(6, -3)$. Hence, find m.

Solution:
Let the vector $\mathbf{P}$ be

$$\mathbf{P} = \begin{pmatrix} 4 \\ m \end{pmatrix}, \tag{1}$$

Given the points,

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

We can use the section formula to find the ratio first and then we can compute the value of m.

Section formula for a vector $\mathbf{P}$ which divides the line formed by vectors $\mathbf{A}$ and $\mathbf{B}$ in the ratio k:1 is given by

$$\mathbf{P} = \frac{k\mathbf{B} + \mathbf{A}}{k + 1} \tag{3}$$

Using section formula,

$$\begin{pmatrix} 4 \\ m \end{pmatrix} = \frac{\begin{pmatrix} 2 \\ 3 \end{pmatrix} + k\begin{pmatrix} 6 \\ -3 \end{pmatrix}}{1 + k} \tag{4}$$

$$\implies \begin{pmatrix} 4 \\ m \end{pmatrix} + k\begin{pmatrix} 4 \\ m \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} + k\begin{pmatrix} 6 \\ -3 \end{pmatrix} \tag{5}$$

$$\implies k\begin{pmatrix} 2 \\ -3 - m \end{pmatrix} = \begin{pmatrix} 2 \\ m - 3 \end{pmatrix} \tag{6}$$

$$\text{or, } k = \frac{1}{1}. \tag{7}$$

$$\implies m = 0. \tag{8}$$

See Fig. 0 ,

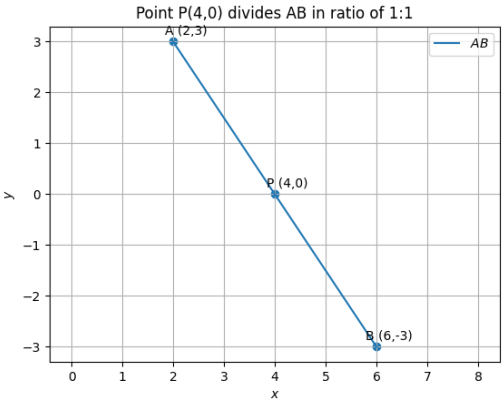

Fig. 0