Question-1-1.5-17

EE24BTECH11038 - MALAKALA BALA SUBRAHMANYA ARAVIND

Question:
The midpoint of line segment joining $\mathbf{A}\,(2a, 4)$ and $\mathbf{B}\,(-2, 3b)$ is $(1, 2a + 1)$. Find the values of a and b.
Solution:

Point	Coordinates
A	$(2a, 4)$
B	$(-2, 3b)$
mid point of **A** and **B** be **C**	$(1, 2a + 1)$

TABLE 0: variables used

$$\mathbf{C} = \frac{\mathbf{A} + \mathbf{B}}{2} \tag{0.1}$$

Now substituting the values of $\mathbf{A}$, $\mathbf{B}$ and $\mathbf{C}$

$$\begin{pmatrix} 1 \\ 2a + 1 \end{pmatrix} = \frac{\begin{pmatrix} 2a \\ 4 \end{pmatrix} + \begin{pmatrix} -2 \\ 3b \end{pmatrix}}{2} \tag{0.2}$$

$$\begin{pmatrix} 2 \\ 4a + 2 \end{pmatrix} = \begin{pmatrix} 2a \\ 4 \end{pmatrix} + \begin{pmatrix} -2 \\ 3b \end{pmatrix} \tag{0.3}$$

$$\begin{pmatrix} 2 \\ 4a + 2 \end{pmatrix} = \begin{pmatrix} 2a - 2 \\ 4 + 3b \end{pmatrix} \tag{0.4}$$

Comparing the matrices we get,

$$2a - 2 = 2 \tag{0.5}$$

$$2a = 4 \tag{0.6}$$

$$a = 2 \tag{0.7}$$

$$\tag{0.8}$$

The other equation is

$$4a + 2 = 4 + 3b \tag{0.9}$$
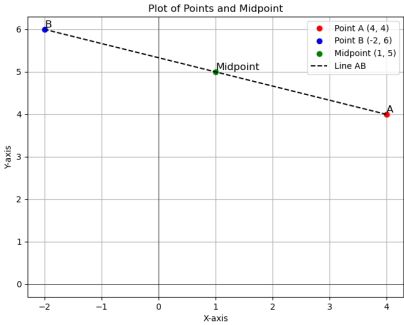
$$4(2) + 2 = 4 + 3b \tag{0.10}$$

$$6 = 3b \tag{0.11}$$

$$b = 2 \tag{0.12}$$

Fig. 0.1: stem plot of line **AB**