1.8.23

EE24BTECH11012 - Bhavanisankar G S

QUESTION:
If $\left(a, b\right)$ is the mid-point of the line segment joining the points A $\left(10, -6\right)$ and B $\left(k, 4\right)$ and $a - 2b = 18$, find the value of a, b and the distance AB .
SOLUTION:

Variable name	Description	Formula
A	10,-6.	$\mathbf{M} = \frac{\mathbf{A+B}}{2}$
B	k,4	A, B, k = ?
M	The midpoint of the line-segment AB with coordinates a, b	$\|\|AB\|\|$ = ?

TABLE 0: Variables Used

We know that if **M** is the mid-point of **AB**, then

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

$$\begin{pmatrix} a \\ b \end{pmatrix} = \frac{\begin{pmatrix} 10 \\ -6 \end{pmatrix} + \begin{pmatrix} k \\ 4 \end{pmatrix}}{2}$$

$$\implies \boxed{\boldsymbol{b = -1}}$$

$$a = 18 + 2b$$

$$\implies \boxed{\boldsymbol{a = 16}}$$

$$k = 2a - 10$$

$$\implies \boxed{\boldsymbol{k = 22}}$$

$$\|\mathbf{B} - \mathbf{A}\| = \sqrt{\left(B - A\right)^T \left(B - A\right)}$$

$$= \sqrt{\begin{pmatrix} 12 & 10 \end{pmatrix} \begin{pmatrix} 12 \\ 10 \end{pmatrix}}$$

$$\boxed{||\mathbf{AB}|| = 2\sqrt{61}}$$

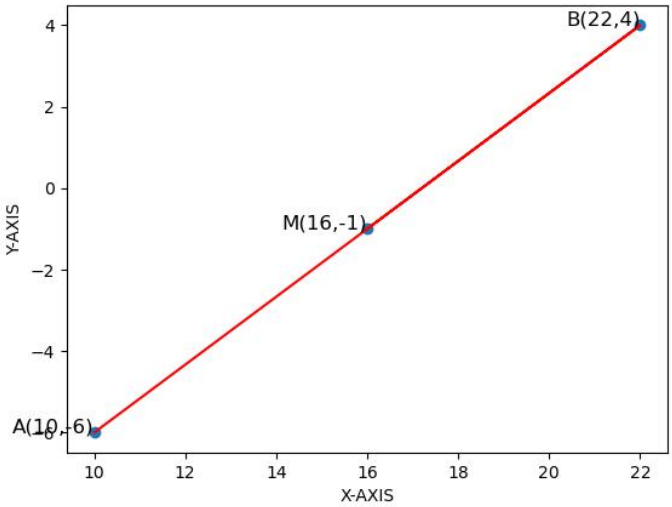

Fig. 0.1: A plot of the given question.