

# 1.9.30

EE24BTECH11021 - Eshan Ray

## Question:

If the distances of  $\mathbf{P} = (x, y)$  from  $\mathbf{A} = (5, 1)$  and  $\mathbf{B} = (-1, 5)$  are equal, then prove that  $3x = 2y$ .

## Solution:

Variable	Description
$\mathbf{A}(5, 1)$	coordinates of first point
$\mathbf{B}(-1, 5)$	coordinates of second point
$\mathbf{P}(x, y)$	Equidistant point of $\mathbf{A}$ and $\mathbf{B}$

TABLE 0: Input parameters

$$\|\mathbf{B} - \mathbf{P}\|^2 = \|\mathbf{A} - \mathbf{P}\|^2 \quad (1)$$

$$\implies \|\mathbf{B} - \mathbf{P}\|^2 = (\mathbf{B} - \mathbf{P})(\mathbf{B} - \mathbf{P})^\top \quad (2)$$

$$\implies \mathbf{B}^2 + \mathbf{P}^2 - 2\mathbf{P}\mathbf{B}^\top = \mathbf{A}^2 + \mathbf{P}^2 - 2\mathbf{P}\mathbf{A}^\top \quad (3)$$

$$\implies \mathbf{P}(\mathbf{A}^\top - \mathbf{B}^\top) = \frac{\mathbf{A}^2 - \mathbf{B}^2}{2} \quad (4)$$

$$\implies \mathbf{P}((5 \ 1) - (-1 \ 5)) = \frac{26 - 26}{2} \quad (5)$$

$$\implies \begin{pmatrix} x \\ y \end{pmatrix} (6 \ -4) = 0 \quad (6)$$

$$\implies 6x - 4y = 0 \quad (7)$$

$$\implies 3x = 2y \quad (8)$$

Hence, proved.

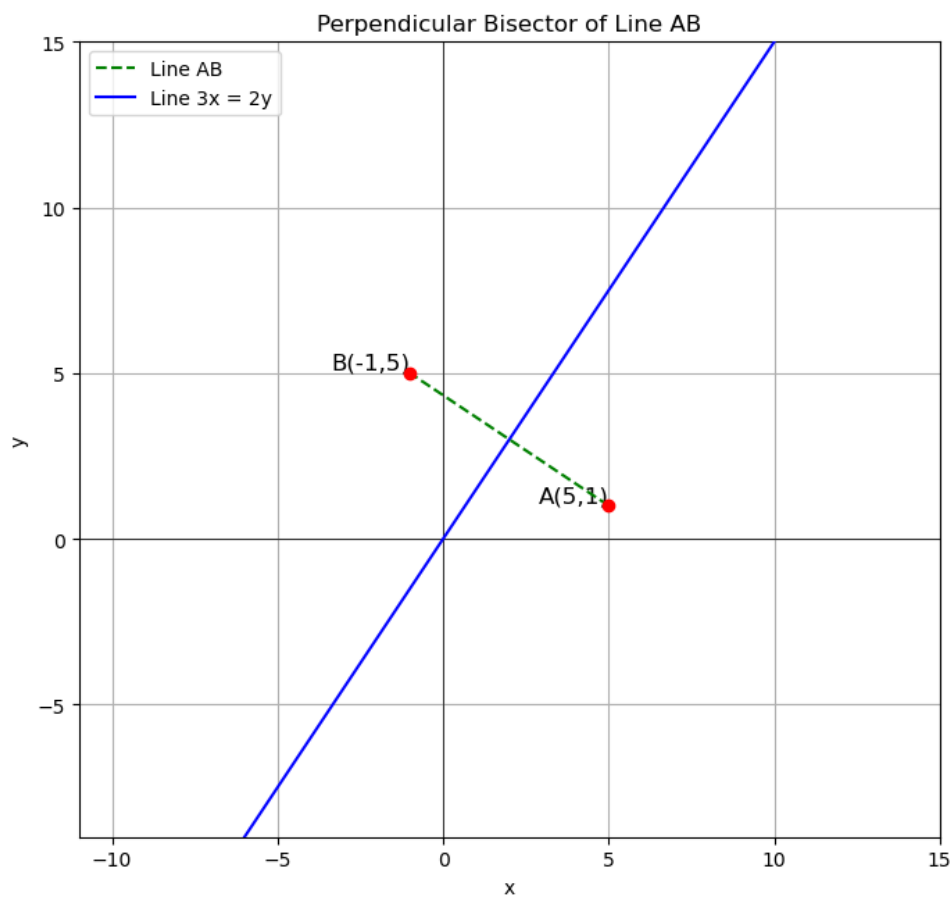


Fig. 0