ASSIGNMENT 2

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1 QUESTION No 2.15

Find the equation of the line passing through $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$ and perpendicular to the line through the points $\begin{pmatrix} 2 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} -3 \\ 6 \end{pmatrix}$

2 SOLUTION

$$\mathbf{A} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -3 \\ 6 \end{pmatrix} \tag{2.0.1}$$

If the direction vector is $\begin{pmatrix} 1 \\ m \end{pmatrix}$ the slope is m

$$\tag{2.0.2}$$

$$\mathbf{m} = \begin{pmatrix} -3 \\ 6 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix} \tag{2.0.3}$$

$$\mathbf{m} = \begin{pmatrix} -5 \\ 1 \end{pmatrix} \tag{2.0.4}$$

$$\mathbf{m} = \frac{-1}{5} \tag{2.0.5}$$

Given point $\mathbf{P} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$ and slope $m = \frac{-1}{5}$.

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \mathbf{m} \tag{2.0.6}$$

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} \frac{-1}{5} \end{pmatrix} \tag{2.0.7}$$

$$= \begin{pmatrix} \frac{1}{5} \\ \frac{-1}{5} \end{pmatrix} \tag{2.0.8}$$

The equation of the line in terms of the normal vector is then obtained as

$$\mathbf{n}^T (\mathbf{x} - \mathbf{P}) = 0 \tag{2.0.9}$$
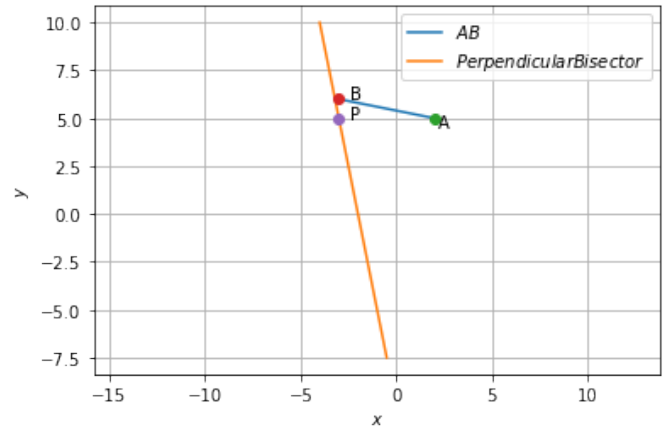
$$\implies \begin{pmatrix} 1 & 5 \end{pmatrix} \mathbf{x} = 22 \tag{2.0.10}$$

Fig. 0: Perpendicular Bisector