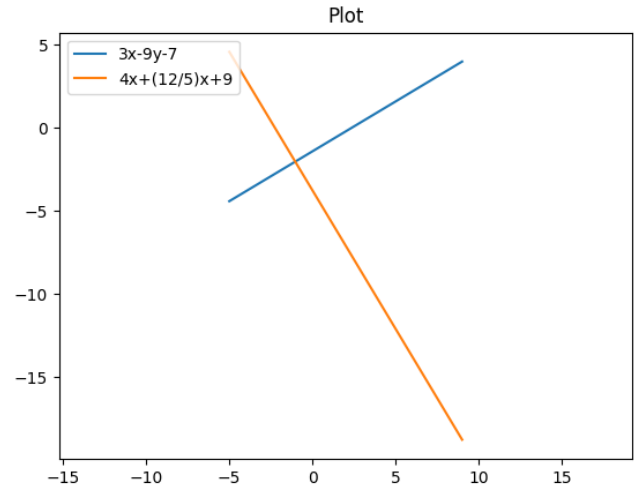


Assignment-1

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If the straight lines $3x - 5y = 7$ and $4x + ay + 9 = 0$ are perpendicular to one another, find the value of a .



Solution

If two lines are perpendicular, then dot product of their normal vectors is 0.

The equation of a line is given by

$$\mathbf{n}^\top \mathbf{x} = c$$

where \mathbf{n} is the normal vector of the line.

Vector form of $3x - 5y = 7$ is

$$\begin{pmatrix} 3 \\ -5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 7, \text{ with } \begin{pmatrix} 3 \\ -5 \end{pmatrix} \text{ as normal vector.}$$

Vector form of $4x + ay + 9 = 0$ is

$$\begin{pmatrix} 4 \\ a \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = -9, \text{ with } \begin{pmatrix} 4 \\ a \end{pmatrix} \text{ as normal vector.}$$

$$\text{As } \begin{pmatrix} 3 \\ -5 \end{pmatrix} \begin{pmatrix} 4 \\ a \end{pmatrix} = 0$$

$$12 - 5a = 0$$

$$\text{So } a = \left(\frac{12}{5}\right)$$