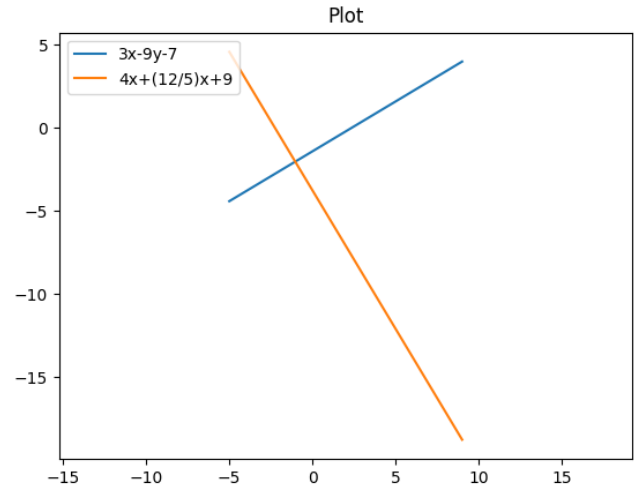# Assignment-1

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4b[ICSE 2018]

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

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

12 - 5a = 0

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