

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 direction ratios is 0.

Vector form of $3x - 5y = 7$ is $\mathbf{r1} = \begin{pmatrix} 4 \\ 1 \end{pmatrix} + t1\begin{pmatrix} 5 \\ 3 \end{pmatrix}$, with $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$ as direction ratio.

Vector form of $4x + ay + 9 = 0$ is $\mathbf{r2} = \begin{pmatrix} -9 \\ 4 \end{pmatrix} + t2\begin{pmatrix} a \\ -4 \end{pmatrix}$, with $\begin{pmatrix} a \\ -4 \end{pmatrix}$ as direction ratio.

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

$$5a - 12 = 0$$

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

