

# 1.7.11

EE24BTECH11021 - Eshan Ray

## Question:

If the pair of equations  $3x - y + 8 = 0$  and  $6x - ry + 16 = 0$  represent coincident lines, then the value of  $r$  is ...

## Solution:

Variable	Description	Formula
$3x - y = -8$	equation of first line	—
$r$	required variable to find	—
$6x - ry = -16$	equation of second line	—
$A$	Coefficient Matrix	$\begin{pmatrix} 3 & -1 \\ 6 & -r \end{pmatrix}$
$B$	Constant Matrix	$\begin{pmatrix} -8 \\ -16 \end{pmatrix}$

TABLE 0: Input parameters

$$\therefore A\mathbf{x} = B \quad (1)$$

$$\begin{pmatrix} 3 & -1 \\ 6 & -r \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -8 \\ -16 \end{pmatrix} \quad (2)$$

$$\text{so, } [A \mid B] = \left( \begin{array}{cc|c} 3 & -1 & -8 \\ 6 & -r & -16 \end{array} \right) \quad (3)$$

Performing row operations:  $R_2 - 2R_1 \longrightarrow R_2$

$$\left( \begin{array}{cc|c} 3 & -1 & -8 \\ 6 - (2)(3) & -r + (2)(1) & -16 + (2)(8) \end{array} \right) = \left( \begin{array}{cc|c} 3 & -1 & -8 \\ 0 & -r + 2 & 0 \end{array} \right) \quad (4)$$

For two lines to be coincident rank of matrix  $[A \mid B]$  must be = 1

$$\therefore -r + 2 = 0 \quad (5)$$

$$\implies r = 2 \quad (6)$$

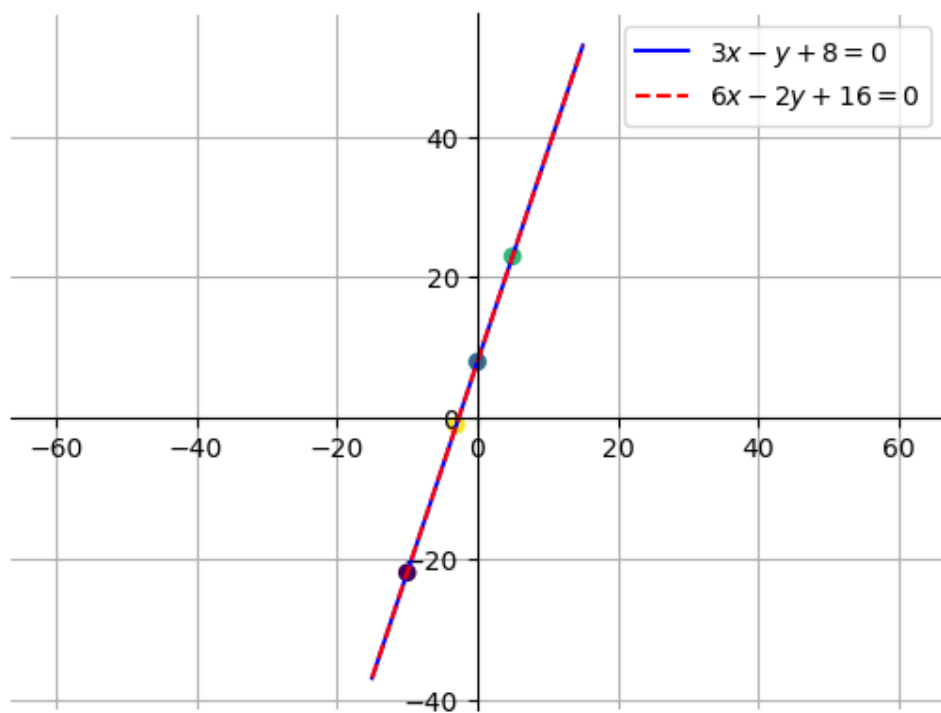


Fig. 0: Coincident Lines