

1.7.7

EE24BTECH11026 - G.Srihaas

QUESTION

For what value of P the points (2, 1), (P, -1) and (-1, 3) are collinear. (10, 2019).

Solution:

Variable name	Description	Formula
A	The point in 2-D plane with coordinates	$\begin{pmatrix} 2 \\ 1 \end{pmatrix}$
B	The point with unknown coordinate	$\begin{pmatrix} P \\ -1 \end{pmatrix}$
C	The point in 2-D plane with coordinates	$\begin{pmatrix} -1 \\ 3 \end{pmatrix}$

Three points **A**, **B** and **C** are said to be collinear if

$$\text{rank}(\mathbf{C} - \mathbf{B} \quad \mathbf{B} - \mathbf{A}) = 1$$

$$\begin{pmatrix} -1 - P & P - 2 \\ 4 & -2 \end{pmatrix} \xrightarrow{R_1 \rightarrow R_1 / (-P-1)} \quad (0.1)$$

$$\begin{pmatrix} 1 & \frac{2-P}{P+1} \\ 4 & -2 \end{pmatrix} \xrightarrow{R_2 \rightarrow R_2 - 4R_1} \quad (0.2)$$

$$\begin{pmatrix} 1 & \frac{2-P}{P+1} \\ 0 & \frac{2P-10}{P+1} \end{pmatrix} \quad (0.3)$$

For the rank of the matrix to be one, $2P - 10 = 0$.

$$P - 5 = 0.$$

$$P = 5.$$

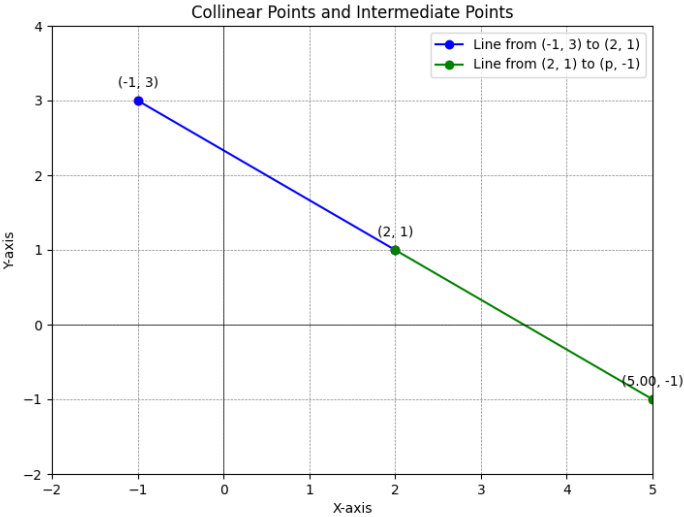


Fig. 0.1: A plot of the given question.