

# 1.6.18

AI25BTECH11003 - Bhavesh Gaikwad

**Question:** Prove that points A(2,1), B(0,5) and C(-1,2) are collinear.

**Solution:**

$$B-A = \begin{pmatrix} 0-2 \\ 5-1 \end{pmatrix} = \begin{pmatrix} -2 \\ 4 \end{pmatrix} \quad C-A = \begin{pmatrix} -1-2 \\ 2-1 \end{pmatrix} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$$

$$M = \begin{pmatrix} B-A & C-A \end{pmatrix} = \begin{pmatrix} -2 & -3 \\ 4 & 1 \end{pmatrix}$$

Row-reduce to compute the rank:

$$\begin{pmatrix} -2 & -3 \\ 4 & 1 \end{pmatrix} \xrightarrow{R_2 \leftarrow R_2 + 2R_1} \begin{pmatrix} -2 & -3 \\ 0 & -5 \end{pmatrix}$$

The echelon form has two nonzero rows, hence  $\text{rank}(M)=2 \neq 1$

*Therefore, The points A(2, 1), B(0, 5) and C(-1, 2) are not collinear.*

(0.1)

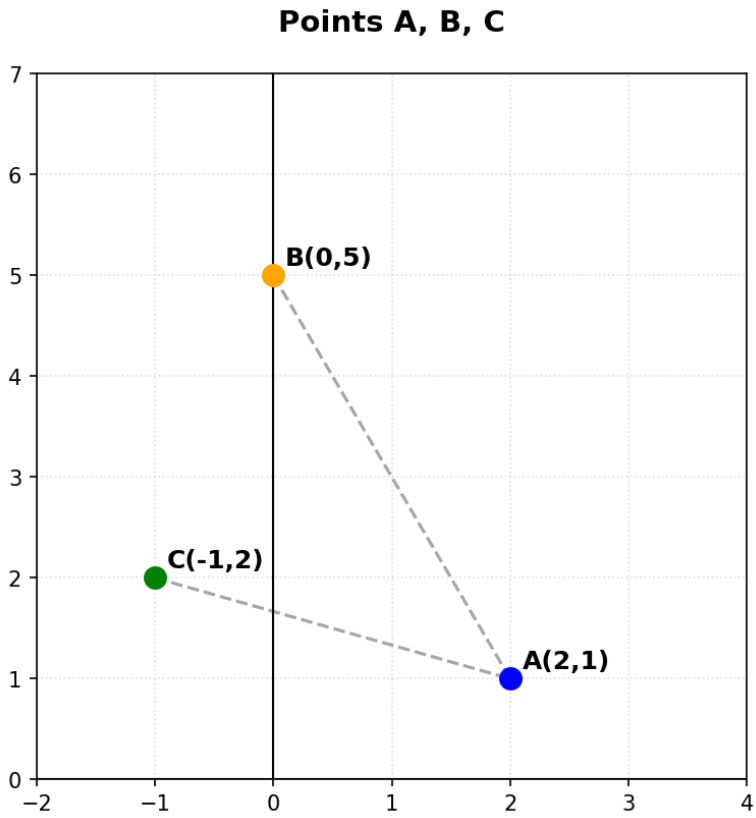


Fig. 0.1: Graph