1.1.6.13

EE24BTECH11059 - Yellanki Siddhanth

Question:
The points $(0,5)$, $(0,-9)$ and $(3,6)$ are collinear
Solution:

Variable	Description	Formula
A	A Point to be plotted	$A = \begin{pmatrix} 0 \\ 5 \end{pmatrix}$
B	A Point to be plotted	$B = \begin{pmatrix} 0 \\ -9 \end{pmatrix}$
C	A Point to be plotted	$C = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$
M	It is a matrix comprising of vectors $B-A$ and $C-A$	$M = [B-A, C-A]$

TABLE 0

The rank of a matrix M is 1, then the matrix is collinear.

$$Rank\,(M) = 1 \tag{0.1}$$

Computing matrix M

$$M = \begin{pmatrix} 0 & 3 \\ -14 & 1 \end{pmatrix} \tag{0.2}$$

Clearly we can conclude that the rank of matrix M is $\neq 1$
$\therefore$ A, B, C are not collinear.

Alternate Solution: If said points A, B, C are collinear, then the area of $\triangle ABC$ is 0.

$$Area = \frac{1}{2} \|(A-B) \times (A-C)\| \tag{0.3}$$

$$Area = \frac{1}{2} \left\| \begin{pmatrix} 0 \\ 14 \end{pmatrix} \times \begin{pmatrix} -3 \\ -1 \end{pmatrix} \right\| \tag{0.4}$$

$$Area = \frac{1}{2} \|-42\| = 21 sq.units \tag{0.5}$$

Since $Area \neq 0$, the points A, B, C are not collinear.

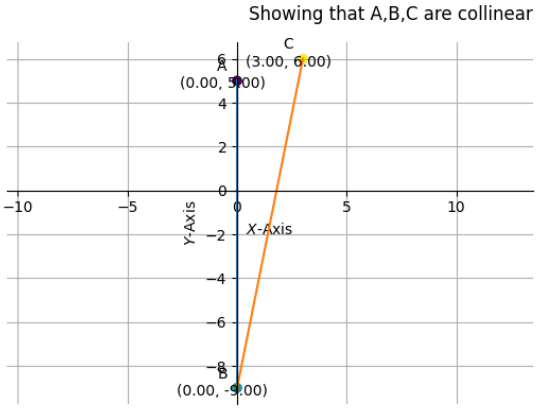
Showing that A,B,C are collinear
C
(3.00, 6.00)
A
(0.00, 5.00)
B
(0.00, -5.00)
Y-Axis
X-Axis
6
4
2
0
−2
−4
−6
−8
−10
−5
0
5
10

Fig. 0.1