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.
(It is a special case as it is square matrix. For an $m \times n$ matrix with $n > m$, the system may have infinitely many solutions if the rank equals m because there are more variables than equations, leading to free variables. If the rank is less than m, no solution may exist. This concept relates to collinearity in that if the vectors (or equations) are not linearly independent, they can lie on the same line, plane, or higher-dimensional space, implying a lack of unique solutions.)

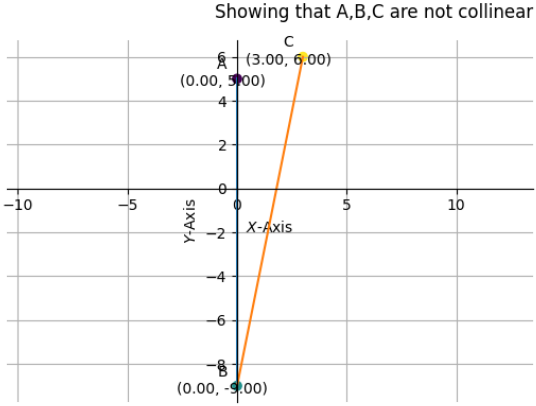
Showing that A,B,C are not collinear
C
(3.00, 6.00)
A
(0.00, 5.00)
B
(0.00, -5.00)
6
4
2
0
−2
−4
−6
−8
−10
−5
0
5
10
Y-Axis
X-Axis

Fig. 0.1