1.6.3

EE25BTECH11052 - Shriyansh Chawda

Question:
Determine if the points (1, 5), (2, 3) and (-2, -11) are collinear.
Solution:
Points $\mathbf{A}, \mathbf{B}, \mathbf{C}$ are defined to be collinear if

$$\text{rank}\begin{pmatrix}\mathbf{B}-\mathbf{A} & \mathbf{C}-\mathbf{A}\end{pmatrix} = 1 \tag{1.1.9.1}$$

Let $\mathbf{A} = (1,5)$, $\mathbf{B} = (2,3)$, $\mathbf{C} = (-2,-11)$. From this, the collinearity matrix can be expressed as

$$\begin{pmatrix}\mathbf{B}-\mathbf{A} & \mathbf{C}-\mathbf{A}\end{pmatrix} = \begin{pmatrix}1 & -3\\ -2 & -16\end{pmatrix} \overset{R_2 \to R_2+2R_1}{\longrightarrow} \begin{pmatrix}1 & -3\\ 0 & -22\end{pmatrix}$$

which is a rank 2 matrix. Using (1.1.9.1), the above-mentioned property, we conclude that the given points are **not** collinear. Graph shown as in the fig. 0.1 .

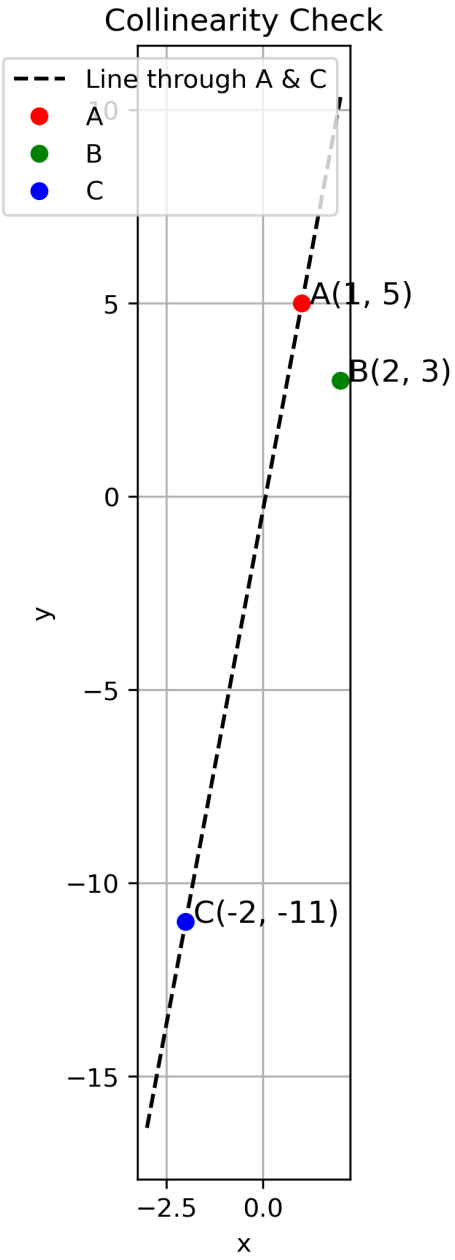
Collinearity Check
Line through A & C
A
B
C
A(1, 5)
B(2, 3)
C(-2, -11)
10
5
0
−5
−10
−15
y
−2.5
0.0
x

Fig. 0.1