Coordinate Geometry

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10th Maths - Chapter 7

This is Problem-3 from Exercise 7.1

1. Determine if the points (1, 5), (2, 3) and (-2, -11) are collinear
   Solution:

$$\mathbf{A} = \begin{pmatrix} 1 \\ 5 \end{pmatrix} \tag{1}$$

$$\mathbf{B} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \tag{2}$$

$$\mathbf{C} = \begin{pmatrix} -2 \\ -11 \end{pmatrix} \tag{3}$$

$$\tag{4}$$

Let us assume that these three points are vertices of a triangle. If the given points are collinear, the area of the triangle will be zero.
The area of a triangle is given by,

$$= \frac{1}{2} \|\mathbf{AB} \times \mathbf{AC}\| \tag{5}$$

$$= \frac{1}{2} \begin{vmatrix} 1 & -3 \\ -2 & -16 \end{vmatrix} \tag{6}$$

$$= \frac{1}{2} \|-16 - (6)\| \tag{7}$$

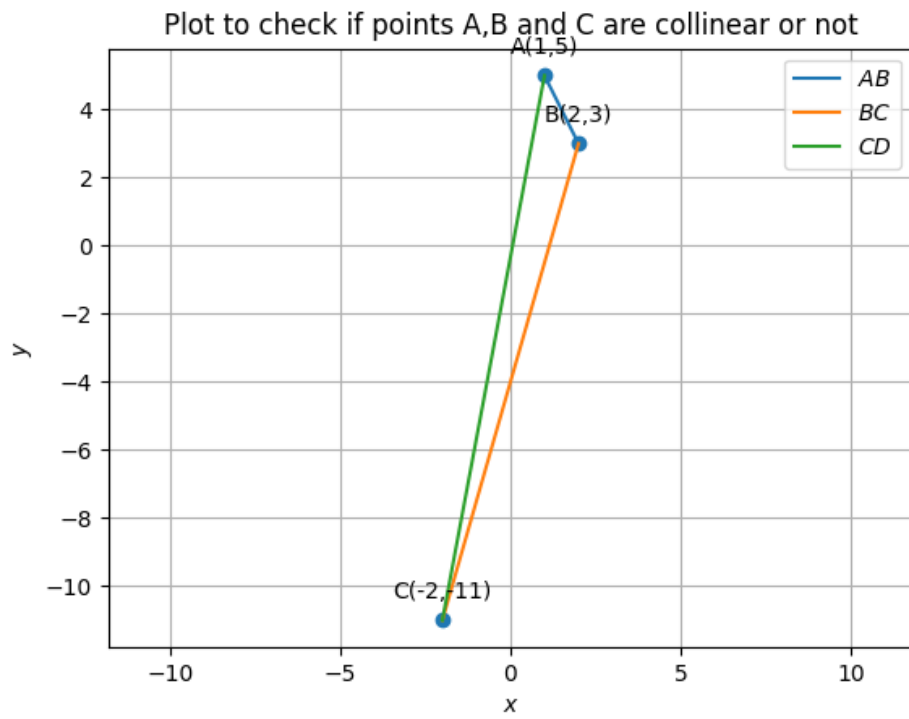$$= 11 \neq 0 \tag{8}$$

Since the area is a non-zero value, the points are not collinear.

Figure 1: Points A,B and C aren't collinear