Assignment 4

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Find Python Codes from below link

> https://github.com/Hruday−Beeravelli/
> INTERNSHIP−IITH−1/blob/main/
> Assignment4/A4.py

and Latex codes from below link

> https://github.com/Hruday−Beeravelli/
> INTERNSHIP−IITH−1/blob/main/
> Assignment4/A4.tex

1 EXAMPLES 2

1.1 Question 11

Prove(by shewing that the area of the triangle formed by them is zero) that the following sets of three points are in a straight line $(-\frac{1}{2}, 3), (-5, 6)$ and $(-8, 8)$

1.2 Solution

Rank of matrix method:
If rank of matrix is not full matrix after row reduction, then points are said to be collinear

$$\left(\begin{pmatrix} \mathbf{A} - \mathbf{B} & \mathbf{A} - \mathbf{C} \end{pmatrix}^\top\right) \quad (1.2.1)$$

Let $\mathbf{A} = \begin{pmatrix} -\frac{1}{2} \\ 3 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -5 \\ 6 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} -8 \\ 8 \end{pmatrix}$

$$\mathbf{A} - \mathbf{B} = \begin{pmatrix} -\frac{1}{2} \\ 3 \end{pmatrix} - \begin{pmatrix} -5 \\ 6 \end{pmatrix} \quad (1.2.2)$$

$$= \begin{pmatrix} \frac{9}{2} \\ -3 \end{pmatrix} \quad (1.2.3)$$

$$\mathbf{A} - \mathbf{C} = \begin{pmatrix} -\frac{1}{2} \\ 3 \end{pmatrix} - \begin{pmatrix} -8 \\ 8 \end{pmatrix} \quad (1.2.4)$$

$$= \begin{pmatrix} \frac{15}{2} \\ -5 \end{pmatrix} \quad (1.2.5)$$

From (1.2.1)
Let

$$\mathbf{M} = \begin{pmatrix} \frac{9}{2} & \frac{15}{2} \\ -3 & -5 \end{pmatrix}^\top \quad (1.2.6)$$

$$= \begin{pmatrix} \frac{9}{2} & -3 \\ \frac{15}{2} & -5 \end{pmatrix} \quad (1.2.7)$$

$$(1.2.8)$$

Row Reduction on $\mathbf{M}$

$$R_2 \leftrightarrows R_2 - \frac{5}{3} \times R_1$$

$$\mathbf{M} = \begin{pmatrix} \frac{9}{2} & -3 \\ 0 & 0 \end{pmatrix} \quad (1.2.9)$$

$$(1.2.10)$$

Since the rank of matrix $\mathbf{M}$ is 1, which is not full rank,
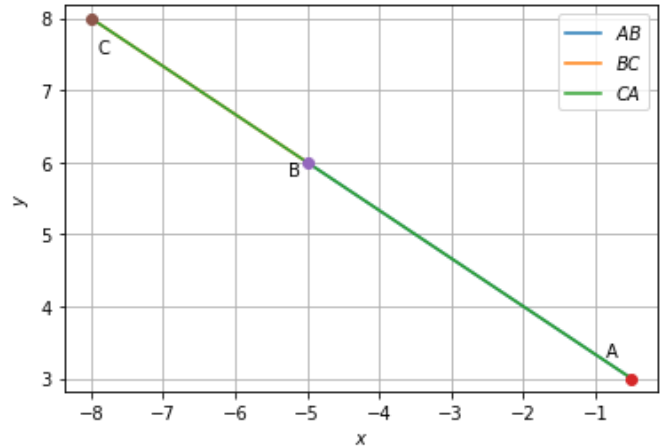therefore the given points are collinear.

Fig. 0