Assignment 4

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Find Python Codes from below link

https://github.com/raghavendra60/Internship/tree/main/Assignment4

and Latex codes from below link

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1 Examples 2

1.1 Question 13

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 $(a, b+c), (b, c+a)$ and $(c, a+b)$

1.2 Solution

$$\frac{1}{2}\left|\left(\mathbf{A}-\mathbf{B}\right) \quad \left(\mathbf{A}-\mathbf{C}\right)\right| \tag{1.2.1}$$

Let $\mathbf{A} = \begin{pmatrix} a \\ b+c \end{pmatrix}, \mathbf{B} = \begin{pmatrix} b \\ c+a \end{pmatrix}, \mathbf{C} = \begin{pmatrix} c \\ a+b \end{pmatrix}$

$$\mathbf{A}-\mathbf{B} = \begin{pmatrix} a \\ b+c \end{pmatrix} - \begin{pmatrix} b \\ c+a \end{pmatrix} \tag{1.2.2}$$

$$= \begin{pmatrix} a-b \\ b-a \end{pmatrix} \tag{1.2.3}$$

$$\mathbf{A}-\mathbf{C} = \begin{pmatrix} a \\ b+c \end{pmatrix} - \begin{pmatrix} c \\ a+b \end{pmatrix} \tag{1.2.4}$$

$$= \begin{pmatrix} a-c \\ c-a \end{pmatrix} \tag{1.2.5}$$

From (1.2.1)

Area of the triangle

$$= \frac{1}{2}\begin{vmatrix} a-b & a-c \\ b-a & c-a \end{vmatrix} \tag{1.2.6}$$

$$= \frac{1}{2}\begin{vmatrix} a-b & a-c \\ -(a-b) & -(a-c) \end{vmatrix} \tag{1.2.7}$$

$$= \frac{1}{2}\left[\left(-(a-b)\times(a-c)\right) - \left(-(a-b)\times(a-c)\right)\right] \tag{1.2.8}$$

$$= 0$$

Since the area is 0, the given points form a straight line.