Assignment 2

Sujal - AI20BTECH11020

Download all latex codes from

https://github.com/https://github.com/sujal100/EE3900/blob/main/Assignment1/Assignment1.tex

Download all python codes from

https://github.com/https://github.com/sujal100/EE3900/blob/main/Assignment1/codes/code.py

1 Problem

(Vectors 2.14) Show that $\mathbf{A} = \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} -1 \\ -2 \\ 1 \end{pmatrix}$ and $\mathbf{C} = \begin{pmatrix} 5 \\ 8 \\ 7 \end{pmatrix}$ are collinear.

2 Solution

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} -3 \\ -5 \\ -3 \end{pmatrix}, \mathbf{C} - \mathbf{A} = \begin{pmatrix} 3 \\ 5 \\ 13 \end{pmatrix} \tag{2.0.1}$$

Forming the matrix M,

$$\mathbf{M} = \begin{pmatrix} \mathbf{B} - \mathbf{A} & \mathbf{C} - \mathbf{A} \end{pmatrix}^{\top} \tag{2.0.2}$$

$$= \begin{pmatrix} -3 & -5 & -3 \\ 3 & 5 & 3 \end{pmatrix} \tag{2.0.3}$$

Using matrix transformation,

$$\mathbf{M} = \begin{pmatrix} -3 & -5 & -3 \\ 3 & 5 & 3 \end{pmatrix} \xleftrightarrow{R_2 \to R_2 + R_1} \begin{pmatrix} -3 & -5 & -3 \\ 0 & 0 & 0 \end{pmatrix} \tag{2.0.4}$$

$$\implies rank(\mathbf{M}) = 1 \tag{2.0.5}$$

Thus, **A**, **B** and **C** are collinear.

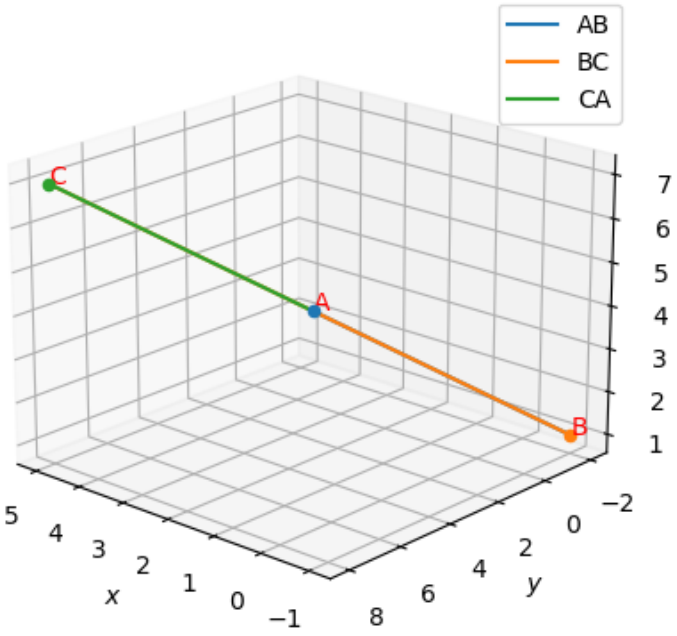

Fig. 0: Plot of the line