

# Assignment 1

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Download all python codes from

<https://github.com/Digjoy12/Signal-Processing/blob/main/Assignment%201/Code/untitled1.py>

and latex codes from

<https://github.com/Digjoy12/Signal-Processing/blob/main/Assignment%201/main.tex>

Using matrix transformation,

$$M = \begin{pmatrix} -5 & -2 \\ 5 & 2 \end{pmatrix} \xrightarrow{R_1 \rightarrow -R_1} \begin{pmatrix} 5 & 2 \\ 5 & 2 \end{pmatrix} \quad (0.0.6)$$

$$\xrightarrow{R_2 \rightarrow R_2 - R_1} \begin{pmatrix} 5 & 2 \\ 0 & 0 \end{pmatrix} \quad (0.0.7)$$

$$(0.0.8)$$

$$\Rightarrow \text{rank}(M) = 1$$

## PROBLEM

**(Vectors - Q2.8)** By using the concept of equation of a line, prove that the three points  $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ ,  $\begin{pmatrix} -2 \\ -2 \end{pmatrix}$  and  $\begin{pmatrix} 8 \\ 2 \end{pmatrix}$  are collinear.

## SOLUTION

Let,  $A = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$ ,  $B = \begin{pmatrix} -2 \\ -2 \end{pmatrix}$  and  $C = \begin{pmatrix} 8 \\ 2 \end{pmatrix}$

Now,

$$B - A = \begin{pmatrix} -2 - 3 \\ -2 - 0 \end{pmatrix} = \begin{pmatrix} -5 \\ -2 \end{pmatrix} \quad (0.0.1)$$

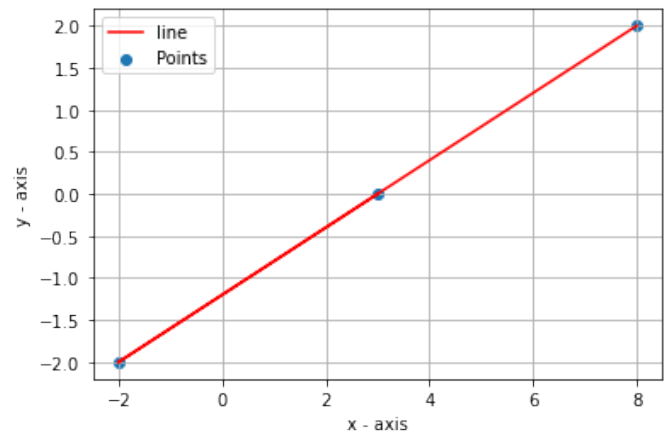
$$C - A = \begin{pmatrix} 8 - 3 \\ 2 - 0 \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \end{pmatrix} \quad (0.0.2)$$

Forming the matrix M,

$$M = \begin{pmatrix} B - A & C - A \end{pmatrix}^T \quad (0.0.3)$$

$$= \begin{pmatrix} -5 & 5 \\ -2 & 2 \end{pmatrix}^T \quad (0.0.4)$$

$$= \begin{pmatrix} -5 & -2 \\ 5 & 2 \end{pmatrix} \quad (0.0.5)$$



Thus, the points are **collinear**.