

1.6.5

EE24BTECH11001 - Aditya Tripathy

Question:

Show that the points $\begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}, \begin{pmatrix} -1 \\ -2 \\ 1 \end{pmatrix}, \begin{pmatrix} 5 \\ 8 \\ 7 \end{pmatrix}$ are collinear.

Solution:

From (1.1.9.1), Points A, B, C are defined to be collinear if

$$\text{rank} \begin{pmatrix} (\mathbf{B} - \mathbf{A})^\top \\ (\mathbf{C} - \mathbf{A})^\top \end{pmatrix} = 1 \quad (0.1)$$

$$(0.2)$$

So, forming the collinearity matrix and doing row operations,

$$\begin{pmatrix} -3 & -5 & -3 \\ 3 & 5 & 3 \end{pmatrix} \xrightarrow{R_2=R_2+R_1} \begin{pmatrix} -3 & -5 & -3 \\ 0 & 0 & 0 \end{pmatrix} \quad (0.3)$$

$$(0.4)$$

Since there is only one non-zero row, rank = 1. Hence the points are collinear.

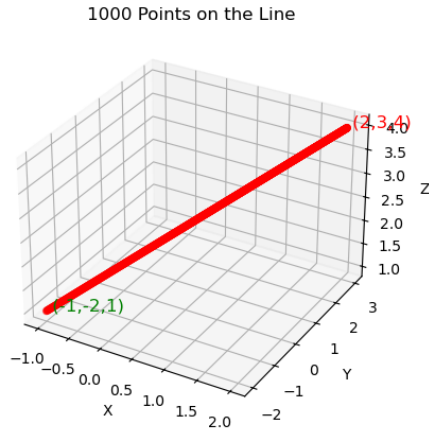


Fig. 0.1: Line joining the three given points