

1.6.10

EE25BTECH11060 - V.Namaswi

Question:

Show that the points **A**(1, -2, -8), **B**(5, 0, -2) and **C**(11, 3, 7) are collinear and find the ratio in which B divides AC.

Solution:

Point	x	y	z
A	1	-2	-8
B	5	0	-2
C	11	3	7

collinearity matrix can be expressed as

$$(B - A \quad C - A) = \begin{pmatrix} 4 & 10 \\ 2 & 5 \\ 6 & 15 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 10 \\ 2 & 5 \\ 6 & 15 \end{pmatrix} \xrightarrow{R_3 \leftarrow R_3 - (R_1 + R_2)} \begin{pmatrix} 4 & 10 \\ 2 & 5 \\ 0 & 0 \end{pmatrix} \xrightarrow{R_2 \leftarrow R_2 - (R_1/2)} \begin{pmatrix} 4 & 10 \\ 0 & 0 \\ 0 & 0 \end{pmatrix} \xrightarrow{R_1 \leftarrow (R_1/4)} \begin{pmatrix} 1 & 2.5 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$

Which is a Rank 1 matrix , Hence **A**(1, -2, -8), **B**(5, 0, -2) and **C**(11, 3, 7) are collinear.

Section formula for a vector **B** which divides the line formed by vectors **A** and **C** in the ratio k:1 is given by

$$\mathbf{B} = \frac{k\mathbf{C} + \mathbf{A}}{k+1} \quad (1)$$

$$\begin{pmatrix} 5 \\ 0 \\ -2 \end{pmatrix} = \frac{\begin{pmatrix} 1 \\ -2 \\ -8 \end{pmatrix} + k \begin{pmatrix} 11 \\ 3 \\ 7 \end{pmatrix}}{1+k} \quad (2)$$

$$\Rightarrow \begin{pmatrix} 5 \\ 0 \\ -2 \end{pmatrix} + k \begin{pmatrix} 5 \\ 0 \\ -2 \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ -8 \end{pmatrix} + k \begin{pmatrix} 11 \\ 3 \\ 7 \end{pmatrix} \quad (3)$$

$$\Rightarrow \begin{pmatrix} 4 \\ 2 \\ 6 \end{pmatrix} = k \begin{pmatrix} 6 \\ 3 \\ 9 \end{pmatrix} \quad (4)$$

$$\Rightarrow k = \frac{2}{3} \quad (5)$$

B which divides **AC** in the ratio 2:3

Refer to Fig. 0

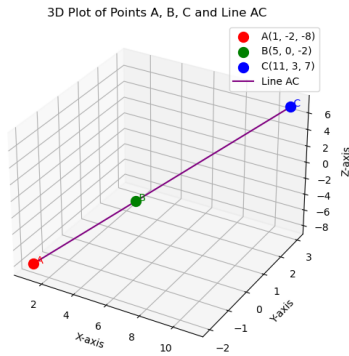


Fig. 0