1.6.10

EE25BTECH11060 - V.Namaswi

Question:
Show that the points $\mathbf{A}(1,-2,-8)$,$\mathbf{B}(5,0,-2)$ and $\mathbf{C}(11,3,7)$ are collinear and find the ratio in which B divides AC.

Solution:

collinearity matrix can be expressed as

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

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

Which is a Rank 1 matrix , Hence $\mathbf{A}(1,-2,-8)$,$\mathbf{B}(5,0,-2)$ and $\mathbf{C}(11,3,7)$ 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

$$\mathbf{B} = \frac{k\mathbf{C} + \mathbf{A}}{k+1} \tag{1}$$

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

$$\implies \begin{pmatrix} 5 \\ 0 \\ -2 \end{pmatrix} + k\begin{pmatrix} 5 \\ 0 \\ -2 \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ -8 \end{pmatrix} + k\begin{pmatrix} 11 \\ 3 \\ 7 \end{pmatrix} \tag{3}$$

$$\implies \begin{pmatrix} 4 \\ 2 \\ 6 \end{pmatrix} = k\begin{pmatrix} 6 \\ 3 \\ 9 \end{pmatrix} \tag{4}$$

$$\implies k = \frac{2}{3} \tag{5}$$

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

Refer to Fig. 0

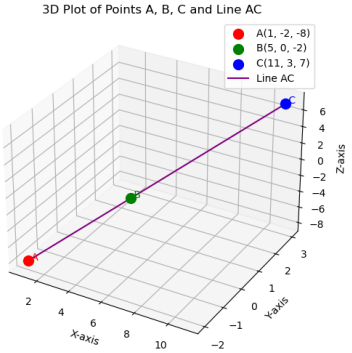

Fig. 0