1.6.10

AI24BTECH11032-Shreyansh Sonkar

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:

Term	Description
X	Equation of line passing through AB

TABLE 1: Terms used

The equation of line passing through A and B is:

$$X = \begin{pmatrix} 1 \\ -2 \\ -8 \end{pmatrix} + k \begin{pmatrix} 4 \\ 2 \\ 6 \end{pmatrix} \tag{0.1}$$

If $k = 2.5$ then, $x = C$

So,C also lies on the line passing through A and B,hence A, B and C are collinear.

Let B divides AB in the ratio n:1 then,

$$B = \frac{nC + A}{n+1} \tag{0.2}$$

so,

$$\begin{pmatrix} 5 \\ 0 \\ -2 \end{pmatrix} = \frac{1}{n+1} \begin{pmatrix} 11n+1 \\ 3n-2 \\ 7n-8 \end{pmatrix} \tag{0.3}$$

Therefore, $n = \frac{2}{3}$

Hence, B divides AC in the ration 2:3

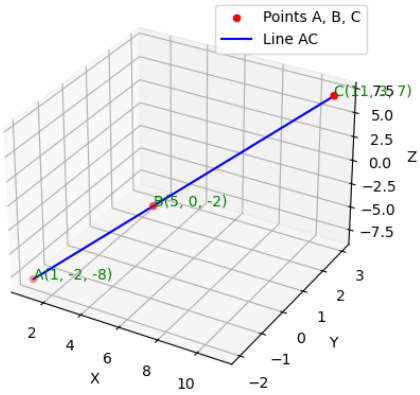

Fig. 0.1: Plot showing the velocity vectors