

1.7.8

AI25btech11022 - Narshitha

Question:

Using vectors , prove that the points $(2, -1, 3)$, $(3, -5, 1)$ and $(-1, 11, 9)$ are collinear.

Solution:

Let

$$\mathbf{A} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 3 \\ -5 \\ 1 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} -1 \\ 11 \\ 9 \end{pmatrix} \quad (1)$$

For the points to be collinear, the following condition should be satisfied.

$$\text{rank}(\mathbf{B} - \mathbf{A} \quad \mathbf{C} - \mathbf{A}) = 1 \quad (2)$$

$$(\mathbf{B} - \mathbf{A} \quad \mathbf{C} - \mathbf{A})^T = \begin{pmatrix} 1 & -4 & -2 \\ -3 & 12 & 6 \end{pmatrix} \quad (3)$$

By doing $R_2 = 3R_1 + R_2$ we get

$$(\mathbf{B} - \mathbf{A} \quad \mathbf{C} - \mathbf{A})^T = \begin{pmatrix} 1 & -4 & -2 \\ 0 & 0 & 0 \end{pmatrix} \quad (4)$$

As $\text{rank} = 1$

\therefore The points are collinear

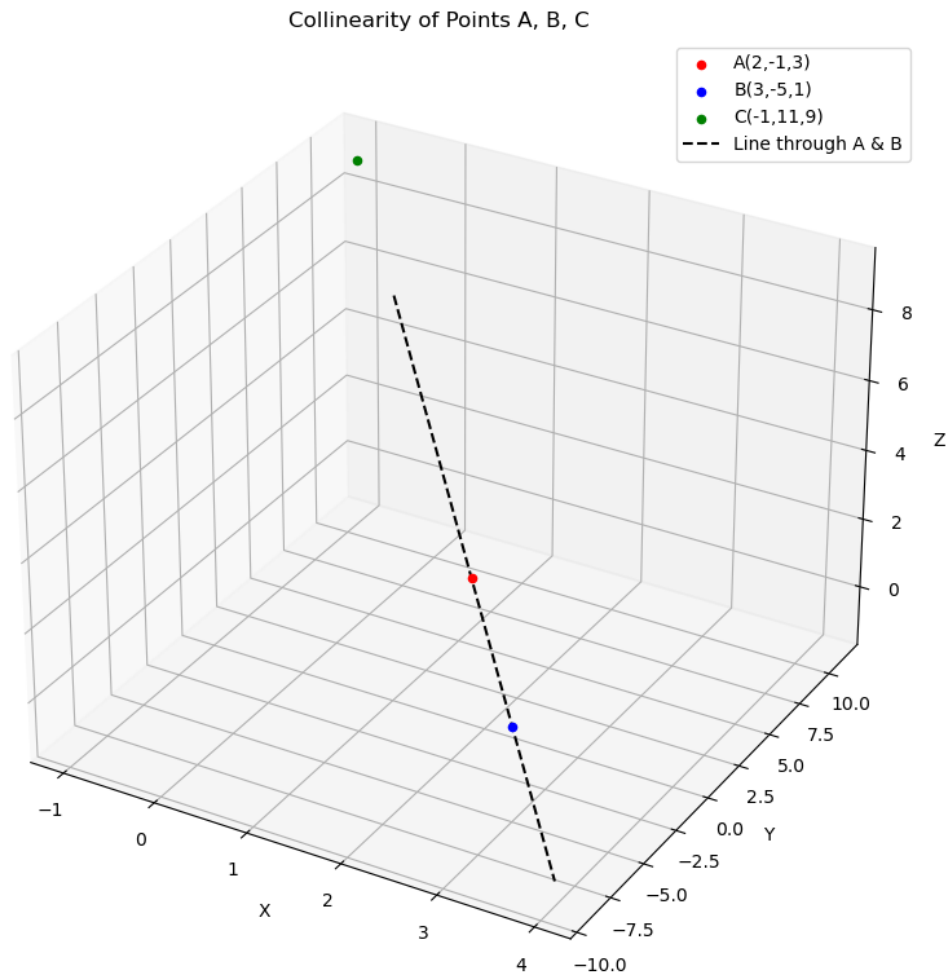


Fig. 0.