1.7.4

AI24BTECH11023 - Tarun Reddy Pakala

Question:
Using vectors, prove that the points $(2,-1,3)$,$(3,-5,1)$ and $(-1,11,9)$ are collinear.
Solution:
Step 1: Calculate the Vectors
The vectors $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are defined as follows:

$$\overrightarrow{AB} = B - A = (3-2, -5-(-1), 1-3) = (1,-4,-2)$$

$$\overrightarrow{AC} = C - A = (-1-2, 11-(-1), 9-3) = (-3,12,6)$$

Step 2: Check for Parallelism
Two vectors are parallel if one is a scalar multiple of the other. We need to determine if there exists a scalar k such that:

$$\overrightarrow{AC} = k \cdot \overrightarrow{AB}$$

This gives us the following system of equations:

$$(-3,12,6) = k(1,-4,-2)$$

From the first component, we have:

$$-3 = k \cdot 1 \quad \Rightarrow \quad k = -3$$

From the second component:

$$12 = k \cdot -4 \quad \Rightarrow \quad k = -3$$

From the third component:

$$6 = k \cdot -2 \quad \Rightarrow \quad k = -3$$

Since we have $k = -3$ for all components, we conclude that:

$$\overrightarrow{AC} = -3 \cdot \overrightarrow{AB}$$

Conclusion
Since $\overrightarrow{AC}$ is a scalar multiple of $\overrightarrow{AB}$, the vectors are parallel. Therefore, the points A, B, and C are collinear.
Thus, the points $(2,-1,3)$, $(3,-5,1)$, and $(-1,11,9)$ are indeed collinear. article graphicx
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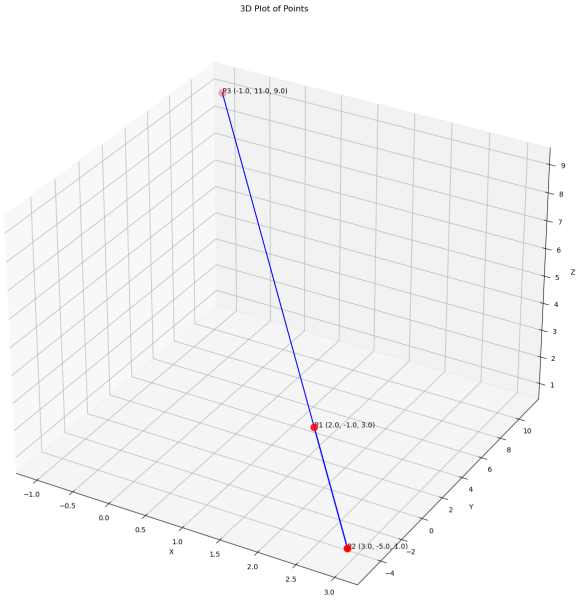
3D Plot of Points
P3 (-1.0, 11.0, 9.0)
P1 (2.0, -1.0, 3.0)
P2 (3.0, -5.0, 1.0)
X
Y
Z