

1.1.2.16

AI24BTECH11027 - R Sumanth

- 1) $(-1, 2, 1)$, $(1, -2, 5)$, $(4, -7, 8)$ and $(2, -3, 4)$ are the vertices of a parallelogram.

Solution:

To show that the points $(-1, 2, 1)$, $(1, -2, 5)$, $(4, -7, 8)$ and $(2, -3, 4)$ form a parallelogram, we need to verify that the opposite sides are equal.

$$A = (-1, 2, 1), \quad B = (1, -2, 5), \quad C = (4, -7, 8), \quad D = (2, -3, 4)$$

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

$$\overrightarrow{BC} = C - B = (4 - 1, -7 - (-2), 8 - 5) = (3, -5, 3)$$

$$\overrightarrow{CD} = D - C = (2 - 4, -3 - (-7), 4 - 8) = (-2, 4, -4)$$

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

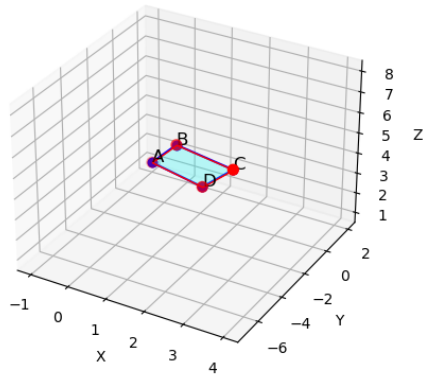
Verify if \overrightarrow{AB} is equal to \overrightarrow{CD} and \overrightarrow{BC} is equal to \overrightarrow{DA} :

$$\overrightarrow{AB} + \overrightarrow{CD} = (2, -4, 4) + (-2, 4, -4) = (0, 0, 0)$$

$$\overrightarrow{BC} + \overrightarrow{DA} = (3, -5, 3) + (-3, 5, -3) = (0, 0, 0)$$

Since $\overrightarrow{AB} + \overrightarrow{CD} = 0$ and $\overrightarrow{BC} + \overrightarrow{DA} = 0$, the quadrilateral formed by the points is a parallelogram.

3D Plot of Parallelogram

Fig. 1: Stem Plot of $y(n)$