Assignment-2

AI24BTECH11027- R Sumanth

I. Vector Arithmetic(CBSE)

Question: $(-\mathbf{1}, \mathbf{2}, \mathbf{1})$, $(\mathbf{1}, -\mathbf{2}, \mathbf{5})$, $(\mathbf{4}, -\mathbf{7}, \mathbf{8})$) and $(\mathbf{2}, -\mathbf{3}, \mathbf{4})$ are the vertices of a parallelogram.

Variable	Value
A	$\begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix}$
B	$\begin{pmatrix} 1 \\ -2 \\ 5 \end{pmatrix}$
C	$\begin{pmatrix} 4 \\ -7 \\ 8 \end{pmatrix}$
D	$\begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix}$

Table 1
Variables Used

Solution: property : opposite sides of parallelogram are equal.

$\mathbf{A}(-1, 2, 1)$, $\mathbf{B}(1, -2, 5)$, $\mathbf{C}(4, -7, 8)$, $\mathbf{D}(2, -3, 4)$

$$AB = B - A = (\mathbf{1} - (-\mathbf{1}), -\mathbf{2} - \mathbf{2}, \mathbf{5} - \mathbf{1}) = (\mathbf{2}, -\mathbf{4}, \mathbf{4}) \tag{1}$$
$$BC = C - B = (\mathbf{4} - \mathbf{1}, -\mathbf{7} - (-\mathbf{2}), \mathbf{8} - \mathbf{5}) = (\mathbf{3}, -\mathbf{5}, \mathbf{3}) \tag{2}$$
$$CD = D - C = (\mathbf{2} - \mathbf{4}, -\mathbf{3} - (-\mathbf{7}), \mathbf{4} - \mathbf{8}) = (-\mathbf{2}, \mathbf{4}, -\mathbf{4}) \tag{3}$$
$$DA = A - D = (-\mathbf{1} - \mathbf{2}, \mathbf{2} - (-\mathbf{3}), \mathbf{1} - \mathbf{4}) = (-\mathbf{3}, \mathbf{5}, -\mathbf{3}) \tag{4}$$

Verify if AB is equal to CD and BC is equal to DA:

$$AB + CD = (\mathbf{2}, -\mathbf{4}, \mathbf{4}) + (-\mathbf{2}, \mathbf{4}, -\mathbf{4}) = (\mathbf{0}, \mathbf{0}, \mathbf{0}) \tag{5}$$
$$BC + DA = (\mathbf{3}, -\mathbf{5}, \mathbf{3}) + (-\mathbf{3}, \mathbf{5}, -\mathbf{3}) = (\mathbf{0}, \mathbf{0}, \mathbf{0}) \tag{6}$$

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

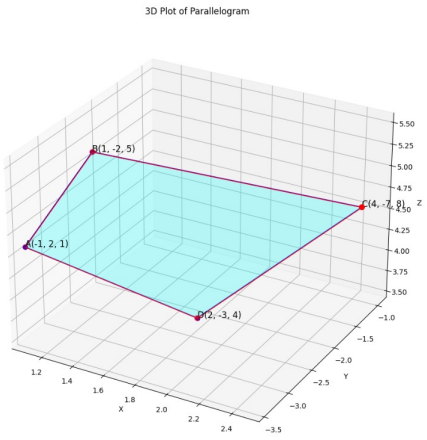

Fig. 1. Stem Plot of y(n)