Assignment-2

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I. Vector Arithmetic(CBSE)

Question: $(-1, 2, 1)$, $(1, -2, 5)$, $(4, -7, 8))$ and $(2, -3, 4)$ 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.

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

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

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

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

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

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

$$\overrightarrow{AB} + \overrightarrow{CD} = (2, -4, 4) + (-2, 4, -4) = (0, 0, 0) \tag{5}$$

$$\overrightarrow{BC} + \overrightarrow{DA} = (3, -5, 3) + (-3, 5, -3) = (0, 0, 0) \tag{6}$$

Since $\overrightarrow{AB} + \overrightarrow{CD} = 0$ and $\overrightarrow{BC} + \overrightarrow{DA} = 0$, the quadrilateral formed by the points is a parallelogram.
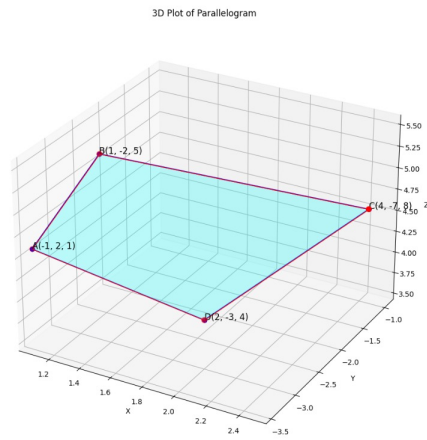
3D Plot of Parallelogram

B(1, -2, 5)

C(4, -7, 8)   Z

A(-1, 2, 1)

D(2, -3, 4)

Fig. 1. Stem Plot of y(*n*)