

1-Vector Arithmetic

EE1030:Matrix Theory

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Question:1.3.3

Points **A**(3,1), **B**(5,1), **C**(a , b), **D**(4,3) are vertices of a parallelogram ABCD. Find the values of a and b . (10,2019)

Solution:

Vertex	Coordinates
A	$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$
B	$\begin{pmatrix} 5 \\ 1 \end{pmatrix}$
C	$\begin{pmatrix} a \\ b \end{pmatrix}$
D	$\begin{pmatrix} 4 \\ 3 \end{pmatrix}$

Table 1.3.3.1 0: Vertex and its coordinates

If ABCD is a parallelogram then,

$$\mathbf{B} - \mathbf{A} = \mathbf{C} - \mathbf{D} \quad (0.1)$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 5 \\ 1 \end{pmatrix} - \begin{pmatrix} 3 \\ 1 \end{pmatrix} \quad (0.2)$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 5 - 3 \\ 1 - 1 \end{pmatrix} \quad (0.3)$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 2 \\ 0 \end{pmatrix} \quad (0.4)$$

$$\mathbf{C} - \mathbf{D} = \begin{pmatrix} a \\ b \end{pmatrix} - \begin{pmatrix} 4 \\ 3 \end{pmatrix} \quad (0.5)$$

$$\mathbf{C} - \mathbf{D} = \begin{pmatrix} a - 4 \\ 3 - b \end{pmatrix} \quad (0.6)$$

$$(0.7)$$

Since $\mathbf{B} - \mathbf{A} = \mathbf{C} - \mathbf{D}$ from equation 0.1 , compare both the equations 0.4 and 0.6

Therefore,

$$\begin{pmatrix} 2 \\ 0 \end{pmatrix} = \begin{pmatrix} a - 4 \\ b - 3 \end{pmatrix} \quad (0.8)$$

$$(0.9)$$

Comparing similar terms,

$$2 = a - 4 \quad (0.10)$$

$$0 = b - 3 \quad (0.11)$$

From equations 0.10 and 0.11 ,

$$a = 6 \quad (0.12)$$

$$b = 3 \quad (0.13)$$

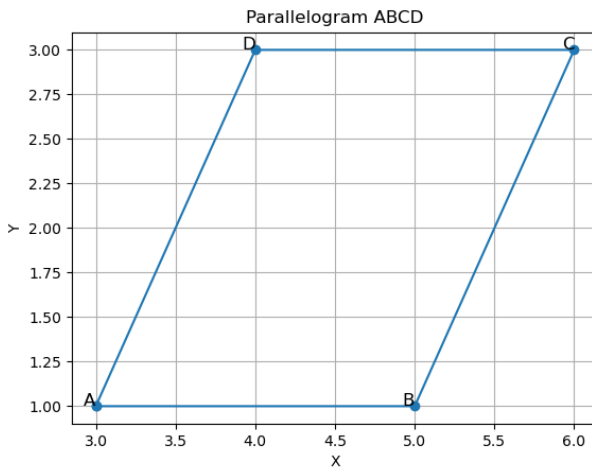


Fig. 0.1: Plot of the Parallelogram