# 1-Vector Arithmetic

EE1030:Matrix Theory

Gajjarapu Satyanarayana
AI24BTECH11009

**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,

$$\mathbf{B} - \mathbf{A} = \mathbf{C} - \mathbf{D} \tag{0.1}$$

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

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

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix}2\\0\end{pmatrix} \tag{0.4}$$

$$\mathbf{C} - \mathbf{D} = \begin{pmatrix}a\\b\end{pmatrix} - \begin{pmatrix}3\\3\end{pmatrix} \tag{0.5}$$

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

$$\tag{0.7}$$

Since **B** - **A** = **C** - **D** from equation 0.1 , compare both the equations 0.4 and 0.6

Therefore,

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

$$\tag{0.9}$$

Comparing similar terms,

$$2 = a - 4 \tag{0.10}$$

$$0 = b - 3 \tag{0.11}$$

From equations 0.10 and 0.11 ,

$$a = 6 \tag{0.12}$$

$$b = 3 \tag{0.13}$$

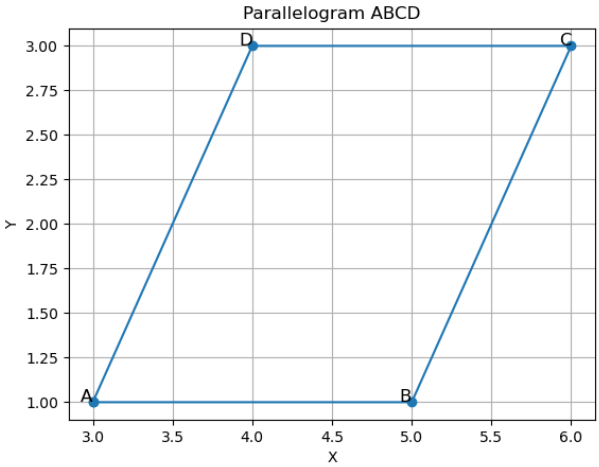


Fig. 0.1: Plot of the Parallelogram