

# Assignment No.1

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<https://github.com/Sekharjala/Assignments/blob/main/code>

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<https://github.com/Sekharjala/Assignments/blob/main/Assignment1.pdf>

## 1 QUESTION No.MATRICES 1.76.1

Question : Find equation of line joining (1,2) and (3,6) using determinants.

## 2 SOLUTION

To construct a line joining  $\mathbf{A} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$  and  $\mathbf{B} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$ , let  $\mathbf{n}$  be the normal vector then

$$\mathbf{n}^T \mathbf{A} = c \quad (2.0.1)$$

$$\mathbf{n}^T \mathbf{B} = c \quad (2.0.2)$$

from Equations(2.0.1) and (2.0.2)

$$\mathbf{A}^T \mathbf{n} = c \quad (2.0.3)$$

$$\mathbf{B}^T \mathbf{n} = c \quad (2.0.4)$$

$$\begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix} \mathbf{n} = \begin{pmatrix} c \\ c \end{pmatrix} \quad (2.0.5)$$

$$\begin{pmatrix} 1 & 2 \\ 3 & 6 \end{pmatrix} \mathbf{n} = \begin{pmatrix} c \\ c \end{pmatrix} \quad (2.0.6)$$

Augmented vector is

$$\begin{pmatrix} 1 & 2 & c \\ 3 & 6 & c \end{pmatrix} = 0 \quad (2.0.7)$$

$$\begin{pmatrix} 1 & 2 & c \\ 3 & 6 & c \end{pmatrix} \quad (2.0.8)$$

$$\xrightarrow{3r_1 - r_2 \rightarrow r_2} \begin{pmatrix} 1 & 2 & c \\ 0 & 0 & -2c \end{pmatrix} \quad (2.0.9)$$

Thus, from the above row reduced form we can conclude that the given system of lines has solution iff "c=0" and points are collinear .

$$\begin{pmatrix} 1 & 2 & 0 \\ 0 & 0 & 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (2.0.10)$$

Directional vector is  $\mathbf{m} = \begin{pmatrix} 1 \\ m \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

Directional vector is

$$\mathbf{m} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \quad (2.0.11)$$

Normal vector

$$\mathbf{n} = \begin{pmatrix} -2 \\ 1 \end{pmatrix} \quad (2.0.12)$$

equation of straight line is from (2.0.1) is

$$\begin{pmatrix} -2 & 1 \end{pmatrix} \mathbf{A} = 0 \quad (2.0.13)$$

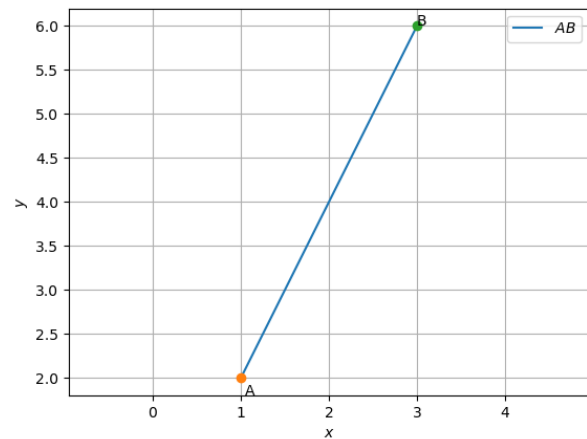


Fig. 0: line formed with points(1,2) and (3,6) using Python