

Assignment No.1

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Download all python codes from

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

and pdf from

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

To calculate inverse of matrix the determinant of a matrix should not be zero then unique solution exists

$$\text{adj} \begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix} = \begin{pmatrix} 6 & -2 \\ -3 & 1 \end{pmatrix}$$

$$\det \begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix} = \begin{vmatrix} 1 & 2 \\ 3 & 6 \end{vmatrix} = 6 - 6 = 0 \quad (2.0.8)$$

Inverse of Matrix does not exist. and Matrix \mathbf{n} can not be formed. Hence The lines formed with equations (2.0.1) and (2.0.2) have same slope and have infinite solutions

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 $\mathbf{B} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$ and let \mathbf{n} be the normal vector then

$$\mathbf{n}^T \mathbf{A} = 1 \quad (2.0.1)$$

$$\mathbf{n}^T \mathbf{B} = 1 \quad (2.0.2)$$

from Equations (2.0.1) and (2.0.2)

$$\mathbf{A}^T \mathbf{n} = 1 \quad (2.0.3)$$

$$\mathbf{B}^T \mathbf{n} = 1 \quad (2.0.4)$$

$$\begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix} \mathbf{n} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (2.0.5)$$

$$\mathbf{n} = \begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix}^{-1} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (2.0.6)$$

$$\begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix}^{-1} = \frac{\text{adj} \begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix}}{\det \begin{pmatrix} \mathbf{A}^T \\ \mathbf{B}^T \end{pmatrix}} \quad (2.0.7)$$

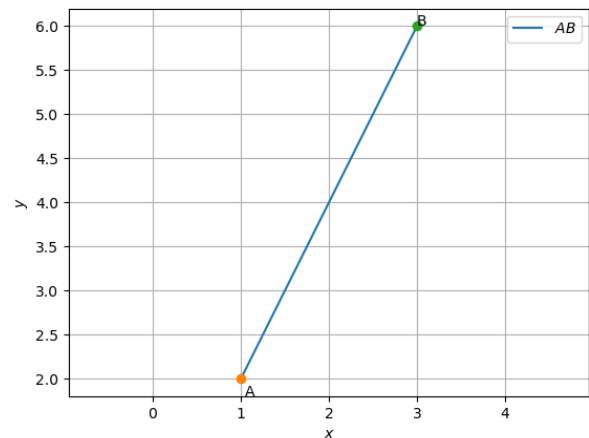


Fig. 0: line formed with points (1,2) and (3,6) using Python

from (2.0.5) the augmented Matrix is

$$\begin{pmatrix} 1 & 2 & 1 \\ 3 & 6 & 1 \end{pmatrix} \quad (2.0.9)$$

$$\begin{pmatrix} 1 & 2 & 1 \\ 3 & 6 & 1 \end{pmatrix} \xrightarrow{3r_1 - r_2 \rightarrow r_2} \begin{pmatrix} 1 & 2 & 1 \\ 0 & 0 & -2 \end{pmatrix} \quad (2.0.10)$$

As the elements of the second Row have only one Non Zero element the system of equations have No Solution for \mathbf{n}