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

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

$$\mathbf{n}^{\mathbf{T}}\mathbf{A} = 1 \tag{2.0.1}$$

$$\mathbf{n}^{\mathbf{T}}\mathbf{B} = 1 \tag{2.0.2}$$

from Equations(2.0.1) and (2.0.2)

$$\mathbf{A}^T\mathbf{n} = 1 \tag{2.0.3}$$

$$\mathbf{B}^T\mathbf{n} = 1 \tag{2.0.4}$$

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

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

For a Square Matrix $\mathbf{X}$

$$\mathbf{X}^{-1} = \frac{adj\mathbf{X}}{\det\mathbf{X}} \tag{2.0.7}$$

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

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

Invese of Matrix dose not exist.

Hence The lines formed with equations(2.0.1)and (2.0.2) have same slope and have infinite solutions

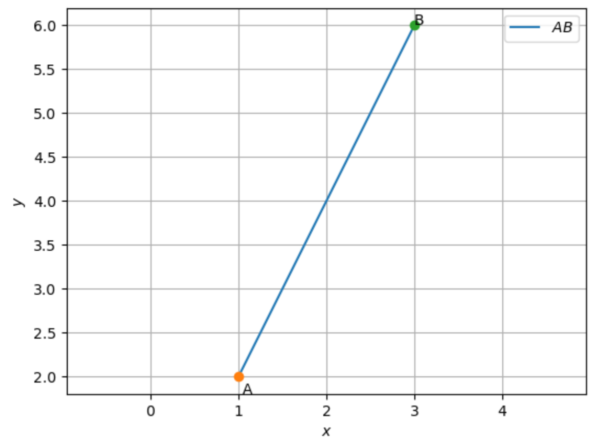

Fig. 0: line formed with points(1,2) and (3,6) using Python

from (2.0.5) the augmented Matrix is

$$\begin{pmatrix} 1 & 2 & 1 \\ 3 & 6 & 1 \end{pmatrix} \tag{2.0.9}$$

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

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