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

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

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

from Equations (2.0.1) and (2.0.2)

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

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

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

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

Augmented Matrix is

$$\begin{pmatrix}1&2&c\\3&6&c\end{pmatrix} \tag{2.0.7}$$

$$\begin{pmatrix}1&2&c\\3&6&c\end{pmatrix} \overset{3R_1-R_2\to R_2}{\longrightarrow} \begin{pmatrix}1&2&c\\0&0&-2c\end{pmatrix} \tag{2.0.8}$$

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 .

$$\begin{pmatrix}1&2&0\\0&0&0\end{pmatrix} \tag{2.0.9}$$

$$\begin{pmatrix}1&2\end{pmatrix}\mathbf{n} = 0 \tag{2.0.10}$$

The normal vector $\mathbf{n}$ to a line is orthogonal to the direction vector m then

$$\mathbf{m}^T\mathbf{n} = 0 \tag{2.0.11}$$

Directional vector is

$$\mathbf{m} = \begin{pmatrix}1\\2\end{pmatrix} \tag{2.0.12}$$

Normal vector

$$\mathbf{n} = \begin{pmatrix}-2\\1\end{pmatrix} \tag{2.0.13}$$

Equation of straight line is

$$\begin{pmatrix}-2&1\end{pmatrix}\mathbf{x} = 0 \tag{2.0.14}$$

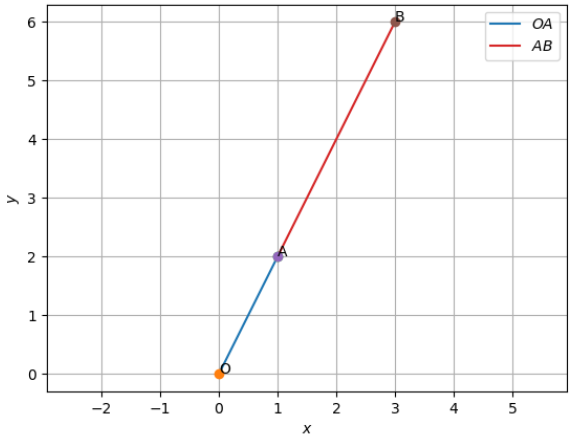

Fig. 0: line formed with points $\begin{pmatrix}1&2\end{pmatrix}$ and $\begin{pmatrix}3&6\end{pmatrix}$ using Python