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 $\mathbf{C} = \begin{pmatrix}x\\y\end{pmatrix}$ and let $\mathbf{n}$ be the normal vector then

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

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

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

from Equations(2.0.1) and (2.0.2)

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

$$\mathbf{B}^{T}\mathbf{n} = 1 \tag{2.0.5}$$

$$\mathbf{C}^{T}\mathbf{n} = 1 \tag{2.0.6}$$

$$\begin{pmatrix}\mathbf{A}^{T}\\\mathbf{B}^{T}\\\mathbf{C}^{T}\end{pmatrix}\mathbf{n} = \begin{pmatrix}1\\1\\1\end{pmatrix} \tag{2.0.7}$$

Now,The augmented Matrix is

$$\begin{pmatrix}1 & 2 & 1\\3 & 6 & 1\\x & y & 1\end{pmatrix} \tag{2.0.8}$$

$$\begin{pmatrix}1 & 2 & 1\\3 & 6 & 1\\x & y & 1\end{pmatrix} \overset{3r_1-r_2\to r_2}{\longrightarrow} \begin{pmatrix}1 & 2 & 1\\0 & 0 & -2\\x & y & 1\end{pmatrix} \tag{2.0.9}$$

Determinant of the above Matrix is zero if **A**,**B** and **C** are collinear

$$\begin{vmatrix}1 & 2 & 1\\0 & 0 & -2\\x & y & 1\end{vmatrix} = 0 \tag{2.0.10}$$

$$1\begin{vmatrix}0 & -2\\y & 1\end{vmatrix} - 2\begin{vmatrix}0 & -2\\x & 1\end{vmatrix} + 1\begin{vmatrix}0 & 0\\x & y\end{vmatrix} = 0$$

-2y-2(-2x)+0=0

$$2x - y = 0 \tag{2.0.11}$$

equation of Line in Vector Form

$$\begin{pmatrix}2 & -1\end{pmatrix}\mathbf{C} = 0 \tag{2.0.12}$$

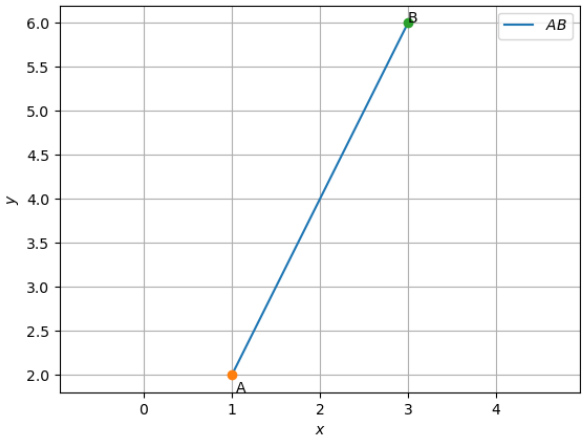

Fig. 0: line formed with points(1,2) and (3,6) using Python