Assignment-5

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***Abstract*—This document contains solution of Problem Ramsey**(4.1.4)

Download latex-tikz codes from

https://github.com/Hrithikraj2/MatrixTheory_EE5609/blob/master/Assignment_5/A5.tex

1 Question

Draw the graphs of the equations

$$\begin{pmatrix}1 & -1\end{pmatrix}\mathbf{x}+1=0 \tag{1.0.1}$$

$$\begin{pmatrix}3 & 2\end{pmatrix}\mathbf{x}-12=0 \tag{1.0.2}$$

Determine the coordinates of the vertices of the triangle formed by these lines and x-axis and shade the triangular region.

2 SOLUTION

Since we need to find the x intercept.Let

$$\mathbf{x}=\begin{pmatrix}a\\0\end{pmatrix} \tag{2.0.1}$$

Substitute in Eq (1.0.1)

$$\implies \begin{pmatrix}1 & -1\end{pmatrix}\begin{pmatrix}a\\0\end{pmatrix}+1=0 \tag{2.0.2}$$

$$\implies a+1=0 \tag{2.0.3}$$

$$\implies a=-1 \tag{2.0.4}$$

The intercept on x axis for Eq (1.0.1) is

$$\begin{pmatrix}-1\\0\end{pmatrix} \tag{2.0.5}$$

Similarly substitute Eq (2.0.1) in Eq (1.0.2),

$$\implies \begin{pmatrix}3 & 2\end{pmatrix}\begin{pmatrix}a\\0\end{pmatrix}-12=0 \tag{2.0.6}$$

$$\implies 3a-12=0 \tag{2.0.7}$$

$$\implies a=4 \tag{2.0.8}$$

The intercept on x axis for Eq (1.0.2) is

$$\begin{pmatrix}4\\0\end{pmatrix} \tag{2.0.9}$$

To obtain the intersection of the lines Eq (1.0.1) and Eq (1.0.2),

$$\begin{pmatrix}1 & -1\\3 & 2\end{pmatrix}\mathbf{x}=\begin{pmatrix}-1\\12\end{pmatrix} \tag{2.0.10}$$

Row reduction for the above augmented matrix is as follows,

$$\begin{pmatrix}1 & -1 & -1\\3 & 2 & 12\end{pmatrix}\xleftrightarrow{R_2\leftarrow\frac{R_2-3R_1}{5}}\begin{pmatrix}1 & -1 & -1\\0 & 1 & 3\end{pmatrix} \tag{2.0.11}$$

$$\xleftrightarrow{R_1\leftarrow R_1+R_2}\begin{pmatrix}1 & 0 & 2\\0 & 1 & 3\end{pmatrix} \tag{2.0.12}$$

$$\implies \mathbf{x}=\begin{pmatrix}2\\3\end{pmatrix} \tag{2.0.13}$$

The triangle formed by Eq (2.0.13), Eq (2.0.5) and Eq (2.0.9) has vertices is shown in Fig 0

$$\mathbf{A}=\begin{pmatrix}2\\3\end{pmatrix},\mathbf{B}=\begin{pmatrix}-1\\0\end{pmatrix},\mathbf{C}=\begin{pmatrix}4\\0\end{pmatrix} \tag{2.0.14}$$

Python Code to verify the result,

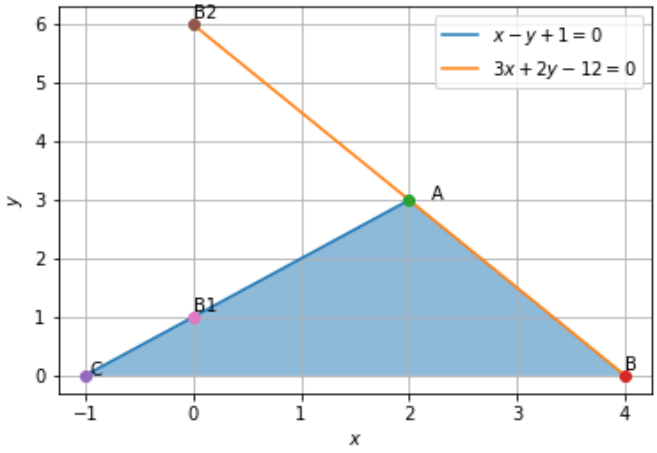

Fig. 0

https://github.com/Hrithikraj2/MatrixTheory_EE5609/blob/master/

Assignment_5/A5.py