Matrix theory Assignment 1

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***Abstract*—This document explains the equation of the line passing through the point of intersection of the lines that has equal intercepts on the axes**

Download all python codes from

https://github.com/pavanmanesh/EE5609/tree/master/codes

and latex-tikz codes from

https://github.com/pavanmanesh/EE5609

1 Problem

Find the equation of the line passing through the point of intersection of the lines

$$(4\ 7)\mathbf{x} = 3$$
$$(2\ -3)\mathbf{x} = -1$$

that has equal intercepts on the axes

2 Solution

Constructing the augmented matrix

$$\begin{pmatrix} 4 & 7 & 3 \\ 2 & -3 & -1 \end{pmatrix}$$

Transforming the matrix into row-echelon form

$$\begin{pmatrix} 4 & 7 & 3 \\ 2 & -3 & -1 \end{pmatrix} \xleftrightarrow{R2 \leftarrow 2R2 - R1}$$
$$\begin{pmatrix} 4 & 7 & 3 \\ 0 & -13 & -5 \end{pmatrix} \xleftrightarrow{R2 \leftarrow -R2/13, R1 \leftarrow R1/4}$$
$$\begin{pmatrix} 1 & 7/4 & 3/4 \\ 0 & 1 & 5/13 \end{pmatrix} \xleftrightarrow{R1 \leftarrow R1 - 7/4R1/4}$$
$$\begin{pmatrix} 1 & 0 & 2/26 \\ 0 & 1 & 5/13 \end{pmatrix} \tag{2.0.1}$$

Thus, The point of intersection is at point (2/26 , 5/13) i.e. (0.07, 0.38) and
we know that the standard equation for the line with intercepts in vector form is ,

$$(1/a\ 1/b)\mathbf{x} = 1$$

As per the question ,a=b. So,The line equation becomes

$$(1\ 1)\mathbf{x} = a$$

As the line passes through the point of intersection (0.07, 0.38), the line equation is

$$(1\ 1)\mathbf{x} = 0.45$$

Plot of the two lines: