

Assignment-1

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Abstract—This assignment finds the equation of the line parallel to the Y-axis drawn through the point of intersection of the lines.

Download all python codes from

<https://github.com/satyam463/matrix-theory/blob/master/assignment>

1 PROBLEM STATEMENT

Find the equation of the line parallel to the Y-axis drawn through the point of intersection of the lines

$$(1 \quad -7)\mathbf{x} = -5 \quad (1.0.1)$$

$$(3 \quad 1)\mathbf{x} = 0 \quad (1.0.2)$$

2 THEORY

consider the equation of the system of lines

$$x - 7y = -5 \quad (2.0.1)$$

$$3x + y = 0 \quad (2.0.2)$$

consider the augmented matrix

$$\begin{pmatrix} 1 & -7 & -5 \\ 3 & 1 & 0 \end{pmatrix} \quad (2.0.3)$$

By applying row reduction technique

$$\begin{pmatrix} 4 & -7 & -5 \\ 3 & 1 & 0 \end{pmatrix} \quad (2.0.4)$$

$$\xleftrightarrow[R_2 \leftarrow R_2/22]{R_2 \leftarrow R_2 - 3R_1} \begin{pmatrix} 1 & -7 & -5 \\ 0 & 1 & \frac{15}{22} \end{pmatrix} \quad (2.0.5)$$

$$\xleftrightarrow{R_1 \leftarrow R_1 + 7R_2} \begin{pmatrix} 1 & 0 & \frac{-5}{22} \\ 0 & 1 & \frac{15}{22} \end{pmatrix} \quad (2.0.6)$$

The value of \mathbf{A} is the point of intersection.

$$\mathbf{A} = \begin{pmatrix} \frac{-5}{22} \\ \frac{15}{22} \end{pmatrix} \quad (2.0.7)$$

Now the equation of line parallel to y-axis through the point of intersection.

$$\mathbf{n}^T(\mathbf{x} - \mathbf{A}) = 0 \quad (2.0.8)$$

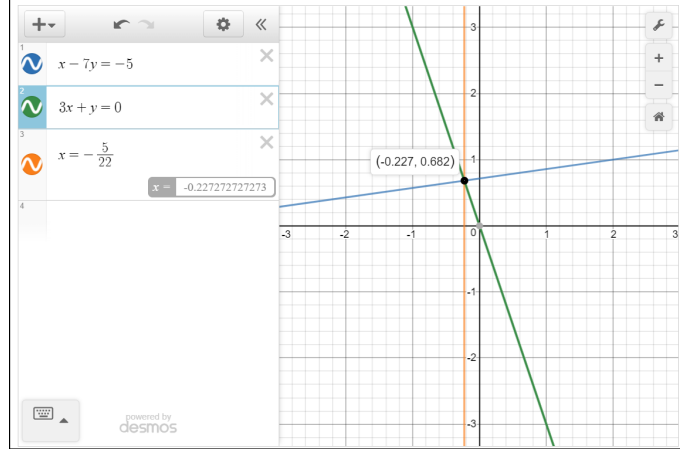


Fig. 0: graphical representation of systems of lines
Shown inline is the equation of the line parallel to the Y-axis drawn through the point of intersection of the lines.

where \mathbf{n} is the vector normal to the Y - axis and \mathbf{A} is the point of intersection

$$\mathbf{n}^T \mathbf{x} = \mathbf{n}^T \mathbf{A} \text{ where } \mathbf{n}^T = (1 \quad 0) \quad (2.0.9)$$

$$(1 \quad 0)\mathbf{x} = (1 \quad 0) \begin{pmatrix} \frac{-5}{22} \\ \frac{15}{22} \end{pmatrix} \quad (2.0.10)$$

$$(1 \quad 0)\mathbf{x} = -\frac{5}{22} \quad (2.0.11)$$