

## 1 Problem Statement

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

$$(1 \quad -7) \mathbf{x} = -5 \text{ and } (3 \quad 1) \mathbf{x} = 0 \quad (1)$$

## 2 Theory

consider the equation of the system of lines

$$x - 7y = -5 \quad (2)$$

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

consider the augmented matrix

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

By applying row reduction technique

$$\begin{pmatrix} 4 & -7 & -5 \\ 3 & 1 & 0 \end{pmatrix} \xrightarrow[R_2 \rightarrow R_2/22]{R_2 \rightarrow R_2 - 3R_1} \begin{pmatrix} 1 & -7 & -5 \\ 0 & 1 & \frac{15}{22} \end{pmatrix} \xrightarrow{R_1 \rightarrow R_1 + 7R_2} \begin{pmatrix} 1 & 0 & \frac{-5}{22} \\ 0 & 1 & \frac{15}{22} \end{pmatrix} \quad (5)$$

$$\text{The value of } \mathbf{A} = \begin{pmatrix} \frac{-5}{22} \\ \frac{15}{22} \end{pmatrix}; \mathbf{A} \text{ is the point of intersection.} \quad (6)$$

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

$$\vec{n}^T \mathbf{x} - A = 0 \quad (7)$$

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

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix} \mathbf{x} = \begin{pmatrix} \frac{-5}{22} \\ \frac{15}{22} \end{pmatrix} \quad (8)$$

$$\mathbf{x} = \begin{pmatrix} \frac{-5}{22} \\ \frac{15}{22} \end{pmatrix} \quad (9)$$

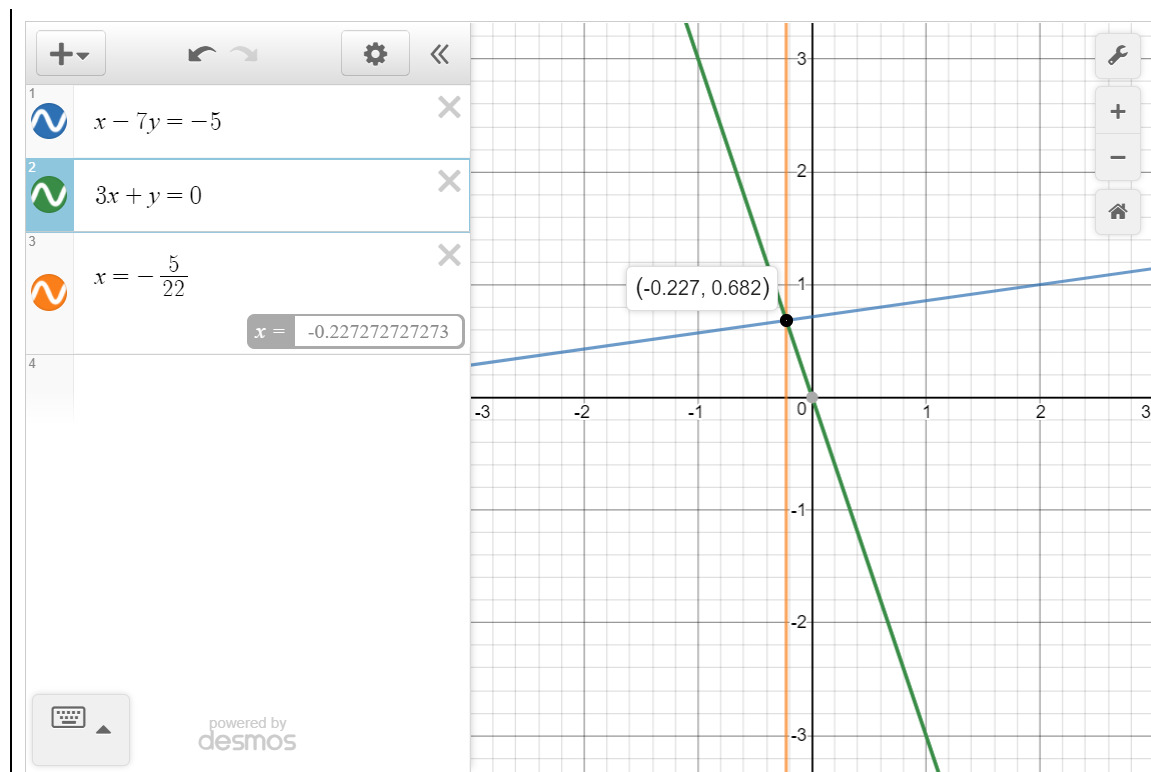


Figure 1: graphical representation of systems of lines