

5.2.5

EE25BTECH11002 - Achat Parth Kalpesh

Question:

Solve the system of equations

$$\frac{bx}{a} - \frac{ay}{b} + a + b = 0 \quad (0.1)$$

$$bx - ay + 2ab = 0 \quad (0.2)$$

Solution:

The above equation can be written as

$$\begin{pmatrix} \frac{b}{a} & -\frac{a}{b} \\ b & -a \end{pmatrix} \mathbf{x} = \begin{pmatrix} -a-b \\ -2ab \end{pmatrix} \quad (0.3)$$

Performing row operations:

$$\left(\begin{array}{cc|c} \frac{b}{a} & -\frac{a}{b} & -a-b \\ b & -a & -2ab \end{array} \right) \xleftrightarrow{R_1 \leftarrow R_1 - \frac{R_2}{b}} \left(\begin{array}{cc|c} \frac{b-a}{a} & 0 & a-b \\ b & -a & -2ab \end{array} \right) \quad (0.4)$$

$$\left(\begin{array}{cc|c} \frac{b-a}{a} & 0 & a-b \\ b & -a & -2ab \end{array} \right) \xleftrightarrow{R_2 \leftarrow -\frac{ab}{b-a} R_1 + R_2} \left(\begin{array}{cc|c} \frac{b-a}{a} & 0 & a-b \\ 0 & -a & -ab \end{array} \right) \quad (0.5)$$

$$\left(\begin{array}{cc|c} \frac{b-a}{a} & 0 & a-b \\ 0 & -a & -ab \end{array} \right) \xleftrightarrow{R_2 \leftarrow -\frac{R_2}{a}} \left(\begin{array}{cc|c} \frac{b-a}{a} & 0 & a-b \\ 0 & 1 & b \end{array} \right) \quad (0.6)$$

$$\left(\begin{array}{cc|c} \frac{b-a}{a} & 0 & a-b \\ 0 & 1 & b \end{array} \right) \xleftrightarrow{R_1 \leftarrow -\frac{a}{b-a} R_2} \left(\begin{array}{cc|c} 1 & 0 & -a \\ 0 & 1 & b \end{array} \right) \quad (0.7)$$

Thus,

$$\mathbf{x} = \begin{pmatrix} -a \\ b \end{pmatrix} \quad (0.8)$$

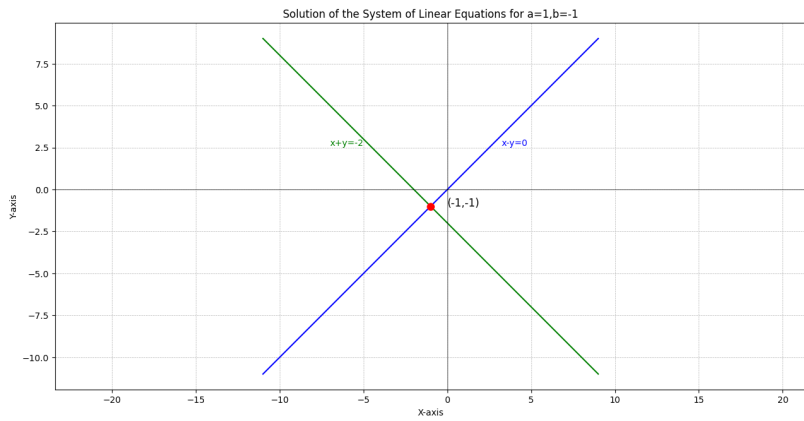


Fig. 0.1: Graph