4.11.30

EE25BTECH11052 - Shriyansh Kalpesh Chawda

Question:

Draw the graph of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Using this graph, find the values of x and y which satisfy both the equations. (10, 2021)

Solution.

Below is the Graph plotted for the given two lines
The lines Intersect at (2,3).
The following is the solution using **Matrices and row Reduction**.

$$\text{Given } \begin{cases} x - y + 1 = 0 \\ 3x + 2y - 12 = 0 \end{cases} \iff \begin{cases} x - y = -1 \\ 3x + 2y = 12 \end{cases}$$

$$\text{Matrix form: } \underbrace{\begin{bmatrix} 1 & -1 \\ 3 & 2 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} x \\ y \end{bmatrix}}_{\mathbf{x}} = \underbrace{\begin{bmatrix} -1 \\ 12 \end{bmatrix}}_{\mathbf{b}}.$$

$$[\, A \mid \mathbf{b} \,] = \left[\begin{array}{cc|c} 1 & -1 & -1 \\ 3 & 2 & 12 \end{array}\right] \xrightarrow{R_2 \leftarrow R_2 - 3R_1} \left[\begin{array}{cc|c} 1 & -1 & -1 \\ 0 & 5 & 15 \end{array}\right] \xrightarrow{R_2 \leftarrow \frac{1}{5}R_2} \left[\begin{array}{cc|c} 1 & -1 & -1 \\ 0 & 1 & 3 \end{array}\right]$$

$$\xrightarrow{R_1 \leftarrow R_1 + R_2} \left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 3 \end{array}\right] \implies x = 2, \quad y = 3.$$

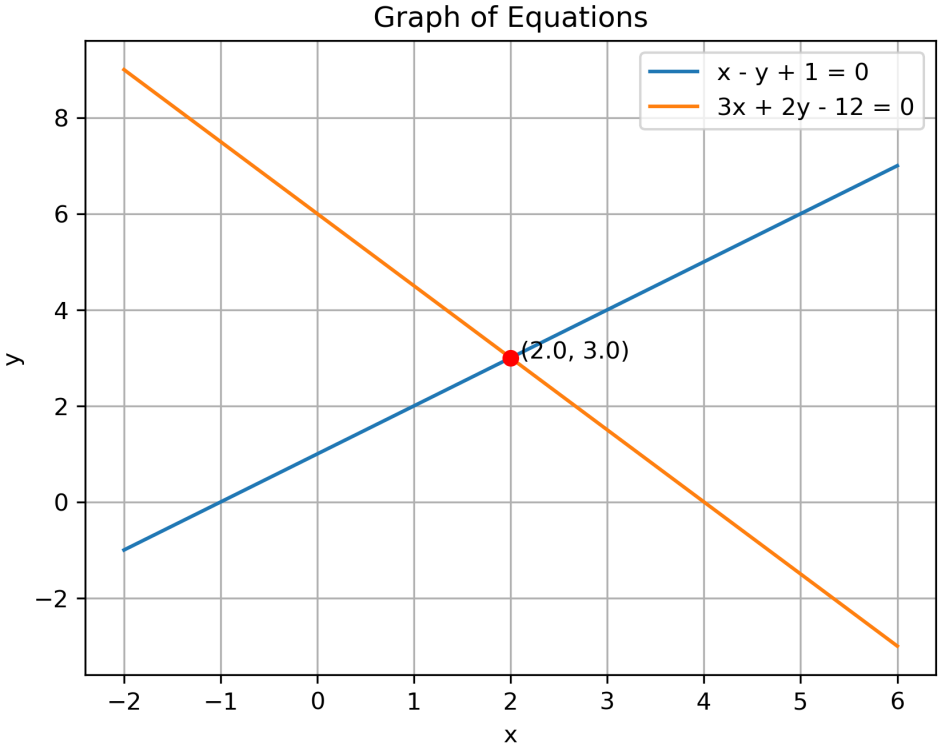

Fig. 0.1