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**.

(i) $x - y + 1 = 0 \implies x - y = -1$
(ii) $3x + 2y - 12 = 0 \implies 3x + 2y = 12$

Thus,

$$\begin{pmatrix} 1 & -1 \\ 3 & 2 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -1 \\ 12 \end{pmatrix} \tag{1}$$

Apply row reduction:

$$R_2 \to R_2 - 3R_1 \tag{2}$$

$$\begin{pmatrix} 1 & -1 \\ 0 & 5 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -1 \\ 15 \end{pmatrix} \tag{3}$$

$$R_2 \to \tfrac{1}{5} R_2 \tag{4}$$

$$\begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -1 \\ 3 \end{pmatrix} \tag{5}$$

$$R_1 \to R_1 + R_2 \tag{6}$$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \tag{7}$$

$$\therefore \ \mathbf{x} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \tag{8}$$

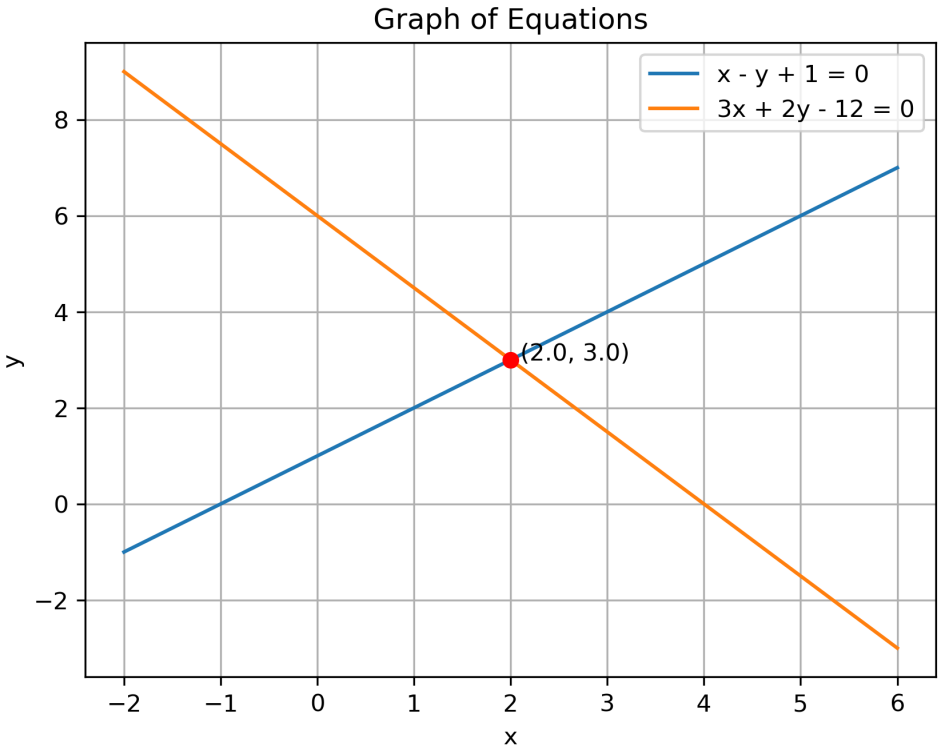

Fig. 1: Intersection of the given lines