

5.3.29

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Question:

Solve for the system of linear equations:

$$x + 2y = 6$$

$$2x - 5y = 12$$

Solution:

Let us solve the given question theoretically and then verify the solution computationally.

According to the question,

The equation of lines given,

$$\begin{pmatrix} 1 & 2 \end{pmatrix} \mathbf{x} = 6 \quad \begin{pmatrix} 2 & -5 \end{pmatrix} \mathbf{x} = 12 \quad (0.1)$$

$$\therefore \begin{pmatrix} 1 & 2 \\ 2 & -5 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 6 \\ 12 \end{pmatrix} \quad (0.2)$$

Forming an augmented matrix,

$$\left(\begin{array}{cc|c} 1 & 2 & 6 \\ 2 & -5 & 12 \end{array} \right) \quad (0.3)$$

Upon doing row reduction,

$$\left(\begin{array}{cc|c} 1 & 2 & 6 \\ 2 & -5 & 12 \end{array} \right) \xleftrightarrow{R_2 \leftarrow R_2 - 2 \times R_1} \left(\begin{array}{cc|c} 1 & 2 & 6 \\ 0 & -9 & 0 \end{array} \right) \xleftrightarrow{R_1 \leftarrow R_1 + \frac{2}{9} \times R_2} \left(\begin{array}{cc|c} 1 & 0 & 6 \\ 0 & -9 & 0 \end{array} \right) \quad (0.4)$$

$$\Rightarrow \mathbf{x} = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \quad (0.5)$$

From the figure, it is clearly verified that the theoretical solution matches with the computational solution.

