

Solve the system

$$\begin{aligned}x - 3y &= 5 \\ 3x + y &= 8\end{aligned}$$

Augmented matrix: $\left[\begin{array}{cc|c} 1 & -3 & 5 \\ 3 & 1 & 8 \end{array} \right]$

$$R_2 - 3R_1 \rightarrow \left[\begin{array}{cc|c} 1 & -3 & 5 \\ 0 & 10 & -7 \end{array} \right]$$

$$\frac{1}{10} \cdot R_2 \rightarrow \left[\begin{array}{cc|c} 1 & -3 & 5 \\ 0 & 1 & -\frac{7}{10} \end{array} \right]$$

$$\begin{aligned}5 + 3\left(-\frac{7}{10}\right) \\ = \frac{50 - 21}{10} = \frac{29}{10}\end{aligned}$$

$$R_1 + 3R_2 \rightarrow \left[\begin{array}{cc|c} 1 & 0 & \frac{29}{10} \\ 0 & 1 & -\frac{7}{10} \end{array} \right]$$

RREF

Solution: $x = \frac{29}{10}, y = -\frac{7}{10}$ or $\left(\frac{29}{10}, -\frac{7}{10}\right)$

The system has a unique solution