

Solving Linear Systems by Elimination Method

Sometimes the Substitution Method is awkward or tedious. Another way to solve systems of equations is to eliminate one variable. This is known as the ELIMINATION METHOD.

$$\begin{aligned} 1. \quad & 2x + 3y = 8 \\ & + 5x - 3y = -1 \end{aligned}$$

$$\frac{7x}{7} = \frac{7}{7}$$

$$x = 1$$

$$\begin{aligned} 2(1) + 3y &= 8 \\ 2 + 3y &= 8 \\ -2 & \quad -2 \\ \hline 3y &= 6 \\ \frac{3y}{3} &= \frac{6}{3} \\ y &= 2 \end{aligned}$$

- Look for **OPPOSITE** coefficients of either x or y.
* You may need to **MULTIPLY** one or BOTH equations!!
- **Add** the equations together.
This should **ELIMINATE** one variable.. if not, check your work!
- **Solve** for the remaining variable.
- Remember that the solution must be a **coordinate point (x, y)**.
- **Substitute** this value into one of the **original** equations.
- Solve for the **remaining** variable.
- Write your solution as a **point**.

The point of intersection is (1, 2)

$$\begin{aligned} 2. \quad & 5x + 2y = 6 \\ & -3x - 4y = 2 \end{aligned} \Rightarrow \begin{aligned} & 10x + 4y = 12 \\ & -3x - 4y = 2 \end{aligned}$$

$$\frac{7x}{7} = \frac{14}{7}$$

$$x = 2$$

$$\begin{aligned} 5(2) + 2y &= 6 \\ 10 + 2y &= 6 \\ -10 & \quad -10 \\ \hline 2y &= -4 \\ \frac{2y}{2} &= \frac{-4}{2} \\ y &= -2 \end{aligned}$$

The point of intersection is (2, -2).

$$\begin{aligned} 3. \quad & 3x + 6y = 12 \quad (\times 4) \\ & 4x + 7y = 11 \quad (\times -3) \end{aligned} \Rightarrow \begin{aligned} & 12x + 24y = 48 \\ & -12x - 21y = -33 \end{aligned}$$

Least Common Multiple of 3 & 4? (12)

$$\begin{aligned} 3y &= 15 \\ \frac{3y}{3} &= \frac{15}{3} \\ y &= 5 \end{aligned}$$

$$\begin{aligned} 3x + 6(5) &= 12 \\ 3x + 30 &= 12 \\ -30 & \quad -30 \\ \hline 3x &= -18 \\ \frac{3x}{3} &= \frac{-18}{3} \\ x &= -6 \end{aligned}$$

The point of intersection is (-6, 5)

→ The solution to a system of equations is the **point of intersection** of the lines on the graph, which is the **only point** that satisfies **BOTH** equations.