

# Solving Systems of Linear Equations in Two Variables by Elimination Method

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# How to Solve Systems of Linear Equations Using the Elimination Method?

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1. Choose which variable you want to eliminate.

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2. Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

# How to Solve Systems of Linear Equations Using the Elimination Method?

1. Choose which variable you want to eliminate.
2. Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.
3. Add the resulting equations.

# How to Solve Systems of Linear Equations Using the Elimination Method?

4. Solve the equation obtained in step 3.

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4. Solve the equation obtained in step 3.
5. Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

# How to Solve Systems of Linear Equations Using the Elimination Method?

4. Solve the equation obtained in step 3.
5. Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.
6. Check the solution in the original equations.



# Example 1

Solve the following system using the elimination method:

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

# Example 1

Step 1: Choose which variable you want to eliminate.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = 4 \\ \mathbf{2x} - \mathbf{2y} = 4 \end{cases}$$

# Example 1

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Use MPE

# Example 1

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = 4 \\ \mathbf{2x} - \mathbf{2y} = 4 \end{cases}$$

Use MPE

$$2(x + y) = 2(4)$$

$$2x - 2y = 4$$

# Example 1

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = 4 \\ \mathbf{2x} - \mathbf{2y} = 4 \end{cases}$$

Use MPE

$$2(x + y) = 2(4)$$

$$2x - 2y = 4$$

Use Distributive Prop.

# Example 1

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = \mathbf{4} \\ \mathbf{2x} - \mathbf{2y} = \mathbf{4} \end{cases}$$

Use MPE

$$2(x + y) = 2(4)$$

$$2x - 2y = 4$$

Use Distributive Prop.

$$2x + 2y = 8$$

$$2x - 2y = 4$$

# Example 1

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = \mathbf{4} \\ \mathbf{2x} - \mathbf{2y} = \mathbf{4} \end{cases}$$

Use MPE

$$2(x + y) = 2(4)$$

$$2x - 2y = 4$$

Use Distributive Prop.

$$2x + 2y = 8$$

$$2x - 2y = 4$$

Add

# Example 1

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = 4 \\ \mathbf{2x} - \mathbf{2y} = 4 \end{cases}$$

Use MPE

$$2(x + y) = 2(4)$$

$$2x - 2y = 4$$

Use Distributive Prop.

$$2x + 2y = 8$$

$$2x - 2y = 4$$

Add

---

$$4x \qquad \qquad = 12$$



# Example 1

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = 4 \\ \mathbf{2x} - \mathbf{2y} = 4 \end{cases}$$

Use MPE

$$2(x + y) = 2(4)$$

$$2x - 2y = 4$$

Use Distributive Prop.

$$2x + 2y = 8$$

$$2x - 2y = 4$$

Add

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$$4x \qquad \qquad = 12$$

Equation 3

# Example 1

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} \mathbf{x} + \mathbf{y} = 4 \\ \mathbf{2x} - \mathbf{2y} = 4 \end{cases}$$

Use MPE

$$2(x + y) = 2(4)$$

$$2x - 2y = 4$$

Use Distributive Prop.

$$2x + 2y = 8$$

$$2x - 2y = 4$$

Add

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$$4x \qquad \qquad = 12$$

Equation 3

$$4x = 12$$

# Example 1

Step 4: Solve the equation obtained in step 3.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

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**Equation 3**

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Step 4: Solve the equation obtained in step 3.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

$$4x = 12$$

Use Division Property

# Example 1

Step 4: Solve the equation obtained in step 3.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

Use Division Property

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

# Example 1

Step 4: Solve the equation obtained in step 3.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

$$4x = 12$$

Use Division Property

$$\frac{4x}{4} = \frac{12}{4}$$

Simplify



# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

Use Division Property

Simplify

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

Use Division Property

Simplify

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$$4x = 12$$

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Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

$$4x = 12$$

Use Division Property

$$\frac{4x}{4} = \frac{12}{4}$$

Simplify

$$x = 3$$

**Equation 1**

$$x + y = 4$$

# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

Use Division Property

Simplify

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

**Equation 1**

Substitute  $x = 3$

$$x + y = 4$$

# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

Use Division Property

Simplify

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

**Equation 1**

Substitute  $x = 3$

$$x + y = 4$$

$$3 + y = 4$$

# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

Use Division Property

Simplify

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

**Equation 1**

Substitute  $x = 3$

Use Subtraction Property

$$x + y = 4$$

$$3 + y = 4$$

# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

**Equation 3**

Use Division Property

Simplify

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

**Equation 1**

Substitute  $x = 3$

Use Subtraction Property

$$x + y = 4$$

$$3 + y = 4$$

$$3 - 3 + y = 4 - 3$$

# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

## Equation 3

Use Division Property

Simplify

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

## Equation 1

Substitute  $x = 3$

Use Subtraction Property

Simplify

$$x + y = 4$$

$$3 + y = 4$$

$$3 - 3 + y = 4 - 3$$



# Example 1

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

## Equation 3

Use Division Property

Simplify

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

## Equation 1

Substitute  $x = 3$

Use Subtraction Property

Simplify

$$x + y = 4$$

$$3 + y = 4$$

$$3 - 3 + y = 4 - 3$$

$$y = 1$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4 \quad \checkmark$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4 \quad \checkmark$$

$$2x - 2y = 4$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4 \quad \checkmark$$

$$2x - 2y = 4$$

$$2(3) - 2(1) = 4$$



# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4 \quad \checkmark$$

$$2x - 2y = 4$$

$$2(3) - 2(1) = 4$$

$$6 - 2 = 4$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4 \quad \checkmark$$

$$2x - 2y = 4$$

$$2(3) - 2(1) = 4$$

$$6 - 2 = 4$$

$$4 = 4$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4 \quad \checkmark$$

$$2x - 2y = 4$$

$$2(3) - 2(1) = 4$$

$$6 - 2 = 4$$

$$4 = 4 \quad \checkmark$$

# Example 1

Step 6: Check the solution in the original equations.

$$\begin{cases} x + y = 4 \\ 2x - 2y = 4 \end{cases}$$

Check:  $x = 3, y = 1$

$$x + y = 4$$

$$3 + 1 = 4$$

$$4 = 4 \quad \checkmark$$

$$2x - 2y = 4$$

$$2(3) - 2(1) = 4$$

$$6 - 2 = 4$$

$$4 = 4 \quad \checkmark$$

$\therefore$  the solution set is  $(3, 1)$ .

# Example 2

Solve the following system using the elimination method:

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

# Example 2

Step 1: Choose which variable you want to eliminate.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

# Example 2

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

# Example 2

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

$$\begin{array}{rclcl} 3x & + & 2y & = & 1 \\ -2(4x & + & y) & = & -2(-2) \end{array}$$



# Example 2

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

$$3x + 2y = 1$$

$$-2(4x + y) = -2(-2)$$

Distribute

# Example 2

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

$$3x + 2y = 1$$

$$-2(4x + y) = -2(-2)$$

Distribute

$$3x + 2y = 1$$

$$-8x - 2y = 4$$

# Example 2

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

$$3x + 2y = 1$$

$$-2(4x + y) = -2(-2)$$

Distribute

$$3x + 2y = 1$$

$$-8x - 2y = 4$$

Add

# Example 2

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

$$3x + 2y = 1$$

$$-2(4x + y) = -2(-2)$$

Distribute

$$3x + 2y = 1$$

$$-8x - 2y = 4$$

Add

---

$$-5x = 5$$

# Example 2

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

$$3x + 2y = 1$$

$$-2(4x + y) = -2(-2)$$

Distribute

$$3x + 2y = 1$$

$$-8x - 2y = 4$$

Add

---

$$-5x = 5$$

Equation 3

# Example 2

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Use MPE

$$3x + 2y = 1$$

$$-2(4x + y) = -2(-2)$$

Distribute

$$3x + 2y = 1$$

$$-8x - 2y = 4$$

Add

---

$$-5x = 5$$

Equation 3

$$-5x = 5$$

# Example 2

Step 4: Solve the equation obtained in step 3.

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**Equation 3**



# Example 2

Step 4: Solve the equation obtained in step 3.

**Equation 3**

$$-5x = 5$$

# Example 2

Step 4: Solve the equation obtained in step 3.

**Equation 3**

$$-5x = 5$$

Use Division Property

# Example 2

Step 4: Solve the equation obtained in step 3.

## Equation 3

Use Division Property

$$\begin{array}{rcl} -5x & = & 5 \\ \hline \frac{-5x}{-5} & = & \frac{5}{-5} \end{array}$$

# Example 2

Step 4: Solve the equation obtained in step 3.

## Equation 3

Use Division Property

Simplify

$$\begin{aligned} -5x &= 5 \\ \frac{-5x}{-5} &= \frac{5}{-5} \end{aligned}$$

# Example 2

Step 4: Solve the equation obtained in step 3.

## Equation 3

Use Division Property

Simplify

$$-5x = 5$$

$$\frac{-5x}{-5} = \frac{5}{-5}$$

$$x = -1$$

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

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Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

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**Equation 1**

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$\mathbf{3x + 2y = 1}$$



# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

$$-3 + 3 + 2y = 1 + 3$$

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

## Equation 1

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

$$-3 + 3 + 2y = 1 + 3$$

Simplify

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

## Equation 1

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

$$-3 + 3 + 2y = 1 + 3$$

Simplify

$$2y = 4$$



# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

$$-3 + 3 + 2y = 1 + 3$$

Simplify

$$2y = 4$$

Use Division Property

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

$$-3 + 3 + 2y = 1 + 3$$

Simplify

$$2y = 4$$

Use Division Property

$$\frac{2y}{2} = \frac{4}{2}$$

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

$$-3 + 3 + 2y = 1 + 3$$

Simplify

$$2y = 4$$

Use Division Property

$$\frac{2y}{2} = \frac{4}{2}$$

Simplify

# Example 2

Step 5: Substitute the value of the variable obtained in step 4 into one of the original equations and solve for the other variable.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

**Equation 1**

$$3x + 2y = 1$$

Substitute  $x = -1$

$$3(-1) + 2y = 1$$

Simplify

$$-3 + 2y = 1$$

Use Addition Prop.

$$-3 + 3 + 2y = 1 + 3$$

Simplify

$$2y = 4$$

Use Division Property

$$\frac{2y}{2} = \frac{4}{2}$$

Simplify

$$y = 2$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$



# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

$$4x + y = -2$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

$$4x + y = -2$$

$$4(-1) + 2 = -2$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

$$4x + y = -2$$

$$4(-1) + 2 = -2$$

$$-4 + 2 = -2$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

$$4x + y = -2$$

$$4(-1) + 2 = -2$$

$$-4 + 2 = -2$$

$$-2 = -2$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

$$4x + y = -2$$

$$4(-1) + 2 = -2$$

$$-4 + 2 = -2$$

$$-2 = -2 \quad \checkmark$$

# Example 2

Step 6: Check the solution in the original equations.

$$\begin{cases} 3x + 2y = 1 \\ 4x + y = -2 \end{cases}$$

Check:  $x = -1, y = 2$

$$3x + 2y = 1$$

$$3(-1) + 2(2) = 1$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

$$4x + y = -2$$

$$4(-1) + 2 = -2$$

$$-4 + 2 = -2$$

$$-2 = -2 \quad \checkmark$$

$\therefore$  the solution set is  $(-1, 2)$ .



# Example 3

Solve the following system using the elimination method:

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

# Example 3

Step 1: Choose which variable you want to eliminate.

**Original system**

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

# Example 3

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

Use MPE

# Example 3

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

Use MPE

$$\begin{array}{rclcl} 2x & + & 4y & = & 10 \\ -2(x & + & 2y) & = & -2(5) \end{array}$$

# Example 3

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

Use MPE

$$2x + 4y = 10$$

$$-2(x + 2y) = -2(5)$$

Distribute

# Example 3

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

Use MPE

$$2x + 4y = 10$$

$$-2(x + 2y) = -2(5)$$

Distribute

$$2x + 4y = 10$$

$$-2x - 4y = -10$$

# Example 3

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} \mathbf{2x + 4y = 10} \\ \mathbf{x + 2y = 5} \end{cases}$$

Use MPE

$$2x + 4y = 10$$

$$-2(x + 2y) = -2(5)$$

Distribute

$$2x + 4y = 10$$

$$-2x - 4y = -10$$

Add

# Example 3

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

Use MPE

$$2x + 4y = 10$$

$$-2(x + 2y) = -2(5)$$

Distribute

$$2x + 4y = 10$$

$$-2x - 4y = -10$$

Add

---

$$0 = 0$$



# Example 3

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} 2x + 4y = 10 \\ x + 2y = 5 \end{cases}$$

Use MPE

$$2x + 4y = 10$$

$$-2(x + 2y) = -2(5)$$

Distribute

$$2x + 4y = 10$$

$$-2x - 4y = -10$$

Add

$$\begin{array}{r} 2x + 4y = 10 \\ -2x - 4y = -10 \\ \hline 0 = 0 \end{array}$$

$\therefore$  the system has infinitely many solutions.

# Example 4

Solve the following system using the elimination method:

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

# Example 4

Step 1: Choose which variable you want to eliminate.

**Original system**

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

# Example 4

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

Use MPE

# Example 4

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

Use MPE

$$\begin{array}{rclcl} -3(x - 3y) & = & -3(-2) \\ 3x - 9y & = & 5 \end{array}$$

# Example 4

Step 2: Multiply one or both equations by an appropriate constant so that the variable that you want to eliminate becomes additive inverse of each other.

**Original system**

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

Use MPE

$$\begin{array}{rcl} -3(x - 3y) & = & -3(-2) \\ 3x - 9y & = & 5 \end{array}$$

Distribute

# Example 4

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} \mathbf{x - 3y = -2} \\ \mathbf{3x - 9y = 5} \end{cases}$$

Use MPE

$$-3(x - 3y) = -3(-2)$$

$$3x - 9y = 5$$

Distribute

$$-3x + 9y = 6$$

$$3x - 9y = 5$$

# Example 4

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

Use MPE

$$-3(x - 3y) = -3(-2)$$

$$3x - 9y = 5$$

Distribute

$$-3x + 9y = 6$$

$$3x - 9y = 5$$

Add



# Example 4

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

Use MPE

$$-3(x - 3y) = -3(-2)$$

$$3x - 9y = 5$$

Distribute

$$-3x + 9y = 6$$

$$3x - 9y = 5$$

Add

---

$$0 \neq 11$$

# Example 4

Step 3: Add the resulting equations.

**Original system**

$$\begin{cases} x - 3y = -2 \\ 3x - 9y = 5 \end{cases}$$

Use MPE

$$-3(x - 3y) = -3(-2)$$

$$3x - 9y = 5$$

Distribute

$$-3x + 9y = 6$$

$$3x - 9y = 5$$

Add

---

$$0 \neq 11$$

$\therefore$  the system has no solution.

**Thank you for watching.**