

5 3 solving systems of linear equations by elimination

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How to Solve Systems of Linear Equations by Elimination

What is Elimination?

Elimination is a method for solving systems of equations by combining like terms and eliminating variables.

Steps for Solving by Elimination:

1. Step 1: Eliminate a Variable

- Choose two equations with the same variable but opposite coefficients.
- Add or subtract these equations to cancel out the variable.

2. Step 2: Solve for the Remaining Variable

- The resulting equation will have only one variable. Solve for that variable.

3. Step 3: Substitute and Solve for the Other Variable

- Substitute the value found in Step 2 back into one of the original equations to solve for the other variable.

Solving with Three Equations:

Follow the same steps as above, but eliminate one variable at a time. Alternatively, use the Cramer's Rule formula.

Formula for Elimination:

Assuming equations in the form $ax + by = c$:

If (a_1, b_1, c_1) and (a_2, b_2, c_2) are coefficients of two equations:

- **Elimination by Addition:** $a_1x + b_1y = c_1 + (a_2x + b_2y = c_2) \rightarrow (a_1+a_2)x + (b_1+b_2)y = c_1+c_2$
- **Elimination by Subtraction:** $a_1x + b_1y = c_1 - (a_2x + b_2y = c_2) \rightarrow (a_1-a_2)x + (b_1-b_2)y = c_1-c_2$

Why Elimination Works:

Combining like terms allows you to simplify the system and focus on solving for one variable at a time.

Solving 3-Line Systems:

- Eliminate one variable at a time.
- Use Cramer's Rule or substitution to solve for the remaining variables.

Solutions to a System of Equations:

- **Unique Solution:** Only one set of values satisfies all equations.
- **Infinitely Many Solutions:** Equations represent the same line or plane.
- **No Solution:** Equations represent parallel lines or planes.

Simple Process of Elimination:

- Add or subtract equations to eliminate a variable.
- Solve for the remaining variables in sequence.

Example of a System of Equations:

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

Elimination Method Calculator:

Online calculators that automate elimination for systems of equations.

4 Steps for Solving by Elimination:

1. Eliminate a variable.
2. Solve for a variable.
3. Substitute and solve.
4. Check solution.

Calculating Elimination:

Apply the elimination formulas mentioned earlier.

Rule of Elimination:

To eliminate a variable, add or subtract equations with the same variable but opposite coefficients.

Solving Elimination Method:

Follow the steps outlined in "Steps for Solving by Elimination."

Example of Elimination in Math:

$$\begin{aligned}2x + y &= 7 \\ -2x + y &= 5\end{aligned}$$

Methods for Linear Systems:

- Elimination

- Substitution
- Matrix Methods

When to Use Elimination:

When the coefficients of one variable are opposites or easily made so.

Solving Systems of Linear Equations:

- Use elimination or substitution.
- Find unique, infinite, or no solutions.

Substitution or Elimination:

Preference depends on the equations' form and coefficients.

Solving 3 Equations with the Elimination Method:

- Eliminate one variable at a time.
- Use Cramer's Rule or substitution to solve for the remaining variables.

System of Three Linear Equations:

A system with three equations and three variables.

Solving 3 Linear Equations with 2 Variables:

- Eliminate one variable at a time.
- Substitute and solve for the remaining variable.

Example of a Linear System with No Solution:

$$x + y = 2$$

$$x + y = 3$$

Three Examples of Linear Equations:

- $y = 2x + 3$
- $x - 2y = 5$

- $3x + 4y = 12$

Independent and Inconsistent Systems:

- **Independent:** Unique solution or infinitely many solutions.
- **Inconsistent:** No solution.

Solving Simultaneous Linear Equations by Elimination:

Follow the steps for elimination mentioned earlier.

Elimination by Multiplication:

- Multiply equations by constants to create coefficients with opposite signs for elimination.

Systems of Linear and Quadratic Equations by Elimination:

- Isolate the quadratic equation in one variable.
- Eliminate the variable in the linear equation(s).
- Substitute and solve for the quadratic variable.

Solving by Substitution:

- Solve one equation for a variable.
- Substitute the expression for that variable into the other equation(s).

Easiest Way to Solve Simultaneous Equations:

- Use elimination or substitution, depending on the equation's form.

Solving Equations Step by Step:

- Identify the type of equation.
- Isolate the variable on one side.
- Solve for the variable.

Solving a 3-Variable Simultaneous Equation:

- Eliminate one variable at a time.
- Use substitution to solve for the remaining variables.

Elimination by Addition in Systems of Equations:

Add two equations with the same variable but opposite coefficients to eliminate that variable.

Solving Systems of Inequalities with Elimination:

- Eliminate variables in the same way as equations.
- Check if the inequality conditions are still satisfied.

Linear Equation by Elimination Method:

A step-by-step process of eliminating variables to solve systems of equations.

Formula for a Linear Equation:

$y = mx + b$, where m is the slope and b is the y-intercept.

Solving a Linear Equation:

- Isolate the variable on one side.
- Use inverse operations to solve for the variable.

Elimination by Substitution Method:

- Solve one equation for a variable.
- Substitute the expression for that variable into the other equation(s).

Finding Point of Intersection Using Elimination:

- Solve for the variables in the system.
- The point of intersection is the solution (x, y) .

4 Methods for Solving Linear Equations in Two Variables:

- Elimination
- Substitution
- Graphing
- Matrix Methods

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