

Solve The System Of Equations. $4y + 11x - 67 = 0$ $2y + 5x - 19 = 0$ X= Y=

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Understanding how to solve systems of equations is a fundamental skill in algebra that allows students and professionals alike to find the values of variables that satisfy multiple conditions simultaneously. In this article, we will explore the methods to solve the given system of equations, clarify the steps involved, and provide practical tips to master solving such problems efficiently.

Understanding the System of Equations

Before diving into the solution, it's essential to interpret the given equations correctly.

Identifying the Equations

The system provided appears to have some typographical errors or missing symbols, but based on standard algebraic notation, we can interpret the equations as:

- $4y + 11x = 67$
- $2y + 5x = 19$

The goal is to find the values of x and y that satisfy both equations simultaneously.

Why Solve Systems of Equations?

Solving systems of equations allows us to:

- Find the point of intersection between two or more lines.
- Model real-world problems involving multiple variables, such as business, physics, and engineering.
- Gain a deeper understanding of relationships between different quantities.

Methods to Solve Systems of Equations

There are several methods for solving systems of equations, including:

Substitution Method

This method involves solving one equation for one variable and substituting that into the other equation.

Elimination Method

Here, the goal is to eliminate one variable by adding or subtracting the equations after aligning coefficients.

Graphical Method

Plotting both equations on a graph and identifying the intersection point.

Choosing the Right Method

For the given system, the elimination method is typically straightforward due to the structure of the equations.

Step-by-Step Solution Using the Elimination Method

Let's proceed with detailed steps to solve the system:

Step 1: Write Down the Equations

Equation 1: $4y + 11x = 67$

Equation 2: $2y + 5x = 19$

Step 2: Make the Coefficients of a Variable Opposite

To eliminate one variable, align the coefficients of y or x .

Let's eliminate y for simplicity:

- Multiply Equation 2 by 2 to match the coefficient of y in Equation 1:

$$(2) (2y + 5x) = 2 \ 19$$

$$\Rightarrow 4y + 10x = 38$$

Now, we have:

$$\text{Equation 1: } 4y + 11x = 67$$

$$\text{Equation 3: } 4y + 10x = 38$$

Step 3: Subtract Equations to Eliminate y

Subtract Equation 3 from Equation 1:

$$(4y + 11x) - (4y + 10x) = 67 - 38$$

$$\Rightarrow 0y + (11x - 10x) = 29$$

$$\Rightarrow x = 29$$

Step 4: Substitute the Value of x into One of the Original Equations

Using Equation 2:

$$2y + 5x = 19$$

Substitute $x = 29$:

$$2y + 5(29) = 19$$

$$\Rightarrow 2y + 145 = 19$$

Step 5: Solve for y

$$2y = 19 - 145$$

$$\Rightarrow 2y = -126$$

$$\Rightarrow y = -63$$

Final Solution

The solution to the system is:

$$X = 29$$

$$Y = -63$$

This means the point (29, -63) satisfies both equations.

Verifying the Solution

Always verify your solution by substituting the values back into the original equations:

- Check Equation 1:

$$4(-63) + 11(29) = ?$$
$$-252 + 319 = 67 \quad \square$$

- Check Equation 2:

$$2(-63) + 5(29) = ?$$
$$-126 + 145 = 19 \quad \square$$

Both equations are satisfied, confirming the solution is correct.

Practical Tips for Solving Systems of Equations

To become proficient at solving systems, consider the following tips:

- **Always verify your solutions:** Substituting back into original equations helps catch mistakes.
- **Choose the most convenient method:** For equations with coefficients that are easy to align, elimination is efficient. For equations where one variable is already isolated, substitution works best.
- **Be cautious with signs and arithmetic:** Small errors can lead to incorrect solutions.
- **Practice with different types of systems:** Linear, nonlinear, with fractions, or with more variables.

Advanced Techniques and Considerations

For more complex systems, other methods may be necessary:

Matrix Method (Using Inverse Matrices)

In systems with multiple variables, representing equations as matrices and using inverse matrices can be efficient, especially with calculator or computer software.

Graphical Interpretation

Visualizing the equations helps understand the nature of solutions:

- One solution (intersecting lines)
- No solution (parallel lines)
- Infinite solutions (coincident lines)

Applications of Solving Systems of Equations

Understanding how to solve systems is essential across various fields:

- Economics: Finding equilibrium points.
- Physics: Calculating intersecting trajectories.
- Engineering: Designing systems with multiple constraints.
- Computer Science: Algorithm development involving multiple variables.

Conclusion

Mastering the process of solving systems of equations, such as the one discussed here, is an invaluable skill that enhances problem-solving capabilities. By systematically applying methods like elimination or substitution, verifying solutions, and understanding the underlying concepts, you can confidently tackle diverse problems involving multiple variables. Remember, practice is key to becoming proficient, and always double-check your solutions to ensure accuracy.

Whether you're a student preparing for exams or a professional solving real-world problems, understanding these techniques will serve as a powerful tool in your analytical toolkit.

Frequently Asked Questions

How can I solve the system of equations $4y + 11x = 67$ and $2y + 5x = 19$ to find the values of x and y ?

You can solve the system using substitution or elimination. For example, solve the second equation for y : $y = (19 - 5x)/2$, then substitute into the first equation and solve for x , followed by finding y .

What is the solution to the system of equations $4y + 11x$

$$= 67 \text{ and } 2y + 5x = 19?$$

By substitution, $y = (19 - 5x)/2$. Plug into the first equation: $4(19 - 5x)/2 + 11x = 67$. Simplify and solve for x , then find y . The solution is $x = 3$, $y = 4$.

Can the system of equations $4y + 11x = 67$ and $2y + 5x = 19$ be solved graphically?

Yes, graphing both equations on a coordinate plane and finding the intersection point gives the solution. The intersection corresponds to the values of x and y that satisfy both equations.

How does the substitution method work for solving the equations $4y + 11x = 67$ and $2y + 5x = 19$?

First, solve one equation for y (e.g., $y = (19 - 5x)/2$). Then substitute this expression into the other equation, resulting in an equation with only x . Solve for x , then substitute back to find y .

What does the notation $X=Y'$ mean in the context of solving these equations?

The notation $X=Y'$ is unclear; it might indicate a relation or that X equals Y , but in the context of solving the system, it suggests looking for values where x equals y or a specific relation between the variables. Clarification is needed for precise interpretation.

Additional Resources

Solve The System Of Equations: An In-Depth Exploration of Techniques, Applications, and Insights

Mathematics has long been regarded as the universal language of problem-solving, with systems of equations playing a pivotal role in various scientific, engineering, and economic domains. Among the foundational tasks in algebra is the process of solving the system of equations, which involves determining the values of variables that satisfy multiple equations simultaneously. In this article, we undertake a comprehensive examination of solving systems of equations, focusing on a specific example:

$$> 4y + 11x - 67 = 0$$

$$> 2y + 5x - 19 = 0$$

We will explore the methodologies, interpret the solutions, and discuss their broader implications, all within an investigative framework that aims to deepen understanding and application.

Understanding Systems of Equations

A system of equations consists of two or more equations with the same set of variables. The goal is to find the values of these variables that satisfy all equations simultaneously. The solutions can be:

- Unique: A single set of values that satisfy all equations.
- Infinite: An infinite set of solutions when the equations describe the same line or plane.
- No solution: When the equations are inconsistent, representing parallel lines or incompatible constraints.

The process of solving involves various algebraic techniques, each suited to different types of systems, including substitution, elimination, and graphical methods.

Analyzing the Given System

The specific system under investigation is:

1. $4y + 11x - 67 = 0$
2. $2y + 5x - 19 = 0$

Rearranged for clarity:

- Equation 1: $4y + 11x = 67$
- Equation 2: $2y + 5x = 19$

This system involves two linear equations with two variables, making it a classic case for algebraic solution methods.

Initial Observations and Setup

Before proceeding to solve, it's beneficial to analyze the structure:

- Both equations are linear; hence, their graphs are straight lines.
- The solutions correspond to points where these lines intersect.
- The coefficients suggest potential for elimination or substitution to find the intersection point.

Methodology for Solving

To systematically solve the system, we will explore two primary methods:

1. Substitution Method

This involves solving one of the equations for one variable and substituting into the other.

2. Elimination Method

This involves aligning coefficients to cancel out one variable, simplifying the process.

Applying the Substitution Method

Given:

- Equation 1: $4y + 11x = 67$
- Equation 2: $2y + 5x = 19$

Step 1: Solve Equation 2 for y:

$$\begin{aligned} 2y + 5x &= 19 \\ \Rightarrow 2y &= 19 - 5x \\ \Rightarrow y &= (19 - 5x) / 2 \end{aligned}$$

Step 2: Substitute y into Equation 1:

$$4 [(19 - 5x)/2] + 11x = 67$$

Simplify:

$$\begin{aligned} (4/2) (19 - 5x) + 11x &= 67 \\ 2 (19 - 5x) + 11x &= 67 \\ (38 - 10x) + 11x &= 67 \end{aligned}$$

Combine like terms:

$$38 + x = 67$$

Solve for x:

$$x = 67 - 38$$

$$x = 29$$

Step 3: Find y using the expression from earlier:

$$y = (19 - 529) / 2$$

$$y = (19 - 145) / 2$$

$$y = (-126) / 2$$

$$y = -63$$

Solution via substitution:

$$> x = 29, y = -63$$

Applying the Elimination Method

Alternate approach for confirmation:

Multiply Equation 2 by 2 to align with Equation 1:

Equation 2 2:

$$(2y + 5x) 2 = 19 2$$

$$\Rightarrow 4y + 10x = 38$$

Now, subtract Equation 1 from this scaled version:

$$(4y + 10x) - (4y + 11x) = 38 - 67$$

$$\Rightarrow 4y - 4y + 10x - 11x = -29$$

$$\Rightarrow -x = -29$$

Solve for x:

$$x = 29$$

Substitute back into Equation 2:

$$2y + 5(29) = 19$$

$$2y + 145 = 19$$

$$2y = 19 - 145$$

$$2y = -126$$

$$y = -63$$

The elimination method confirms the earlier solution:

$$> x = 29, y = -63$$

Interpreting the Solution

The solution ($x = 29$, $y = -63$) indicates a single point where the two lines intersect. Graphically, this point is the unique intersection of the lines represented by the original equations.

Verifying the Solution

Substitute back into original equations:

- Equation 1: $4y + 11x = 67$

$$4(-63) + 11(29) = -252 + 319 = 67 \quad \square$$

- Equation 2: $2y + 5x = 19$

$$2(-63) + 5(29) = -126 + 145 = 19 \quad \square$$

Both satisfy the equations, confirming correctness.

Broader Implications and Applications

The process elucidated here extends beyond academic exercises. Solving systems of equations is fundamental in:

- Engineering: Designing circuits, structural analysis, and control systems.
- Economics: Modeling supply and demand equilibria.
- Physics: Analyzing forces, velocities, and trajectories.
- Computer Science: Algorithms for optimization and machine learning.

Understanding the techniques for solving such systems enables practitioners to model complex real-world problems accurately.

Advanced Topics and Edge Cases

While linear systems with two variables are straightforward, complexities arise in different scenarios:

- Dependent Systems: When equations describe the same line, leading to infinitely many solutions.

- Inconsistent Systems: Parallel lines with no intersection, resulting in no solution.
- Nonlinear Systems: Incorporating quadratic or higher-degree equations, requiring more sophisticated methods like substitution, elimination, or numerical approaches.

Conclusion: The Significance of Solve The System Of Equations

The exercise of solving the system:

$$> 4y + 11x - 67 = 0$$

$$> 2y + 5x - 19 = 0$$

demonstrates the core principles of algebraic problem-solving, emphasizing the importance of methodical approaches like substitution and elimination. The confirmed solution underscores the power of algebra to provide precise, reliable answers to complex problems.

As systems of equations underpin numerous scientific and technological fields, mastering these methods is essential for students, engineers, analysts, and researchers. The ability to interpret and solve such systems fosters critical thinking and analytical skills, vital for innovation and problem-solving in an increasingly data-driven world.

In essence, solving the system of equations is not merely an academic exercise but a foundational skill that bridges theory and real-world application, empowering us to decode the language of the universe with clarity and confidence.

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