What Is The Result Of Subtracting The Second Equation From The First? -2x+y = 0-7x+3y = 2

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Understanding how to manipulate and interpret systems of equations is fundamental in algebra. One common operation involves subtracting one equation from another, which can reveal important relationships between variables or simplify complex systems. In this article, we will explore what happens when you subtract the second equation from the first in the given system:

$-2x + y = 0$
$-7x + 3y = 2$

By carefully analyzing this process, we aim to clarify not just the algebraic steps involved but also the significance of the resulting equation in the context of solving systems of linear equations.

Introduction to Subtracting Equations in Algebra

In algebra, systems of equations are collections of two or more equations with common variables. These systems can be solved using various methods such as substitution, elimination, or graphing. The subtraction (or elimination) method involves adding or subtracting equations to eliminate one variable, making it easier to solve for the remaining variables.

Key concepts include:

- Elimination Method: Adding or subtracting equations to eliminate a variable.
- Linear Equations: Equations of the first degree, such as those given.
- Solution of a System: The set of values for variables that satisfy all equations simultaneously.

Subtracting equations is particularly useful when the coefficients of one variable are opposites or can be made opposites through multiplication, facilitating elimination.

Step-by-Step Process of Subtracting the Second Equation from the First

Let's analyze the specific system:

1. First Equation (Equation 1):
$-2x + y = 0$

2. Second Equation (Equation 2):
$-7x + 3y = 2$

The goal is to find the result of subtracting Equation 2 from Equation 1:

(Equation 1) - (Equation 2):
$$
(-2x + y) - (-7x + 3y) = 0 - 2
$$

Performing the Subtraction Step-by-Step

When subtracting the equations, distribute the minus sign across the second equation:

$$
-2x + y + 7x - 3y = -2
$$

Now, combine like terms:

- Combine x terms: $-2x + 7x = 5x$
- Combine y terms: $y - 3y = -2y$

This simplifies to:

$$
5x - 2y = -2
$$

Resulting Equation:

$$
\boxed{5x - 2y = -2}
$$

This is the new equation obtained from subtracting the second equation from the first.

Interpreting the Resulting Equation

The equation $5x - 2y = -2$ is a linear equation representing a straight line in the xy-plane. It is derived from the original system and can be used in various ways:

- To find the relation between x and y that satisfies the difference between the two original equations.
- As a step in solving the system using elimination or substitution methods.
- To analyze the relationship and intersection points of the original lines.

Why is this important?
Subtracting equations helps eliminate variables or create new equations that can make solving the system more straightforward.

Understanding the Geometric Interpretation

Each linear equation in two variables corresponds to a line in the coordinate plane. When you subtract one equation from another:

- You are effectively creating a new line that represents the difference between the two original lines.
- The resulting equation $5x - 2y = -2$ can be viewed as the line that measures the difference in values of x and y along the points where the original lines are related.

Graphical interpretation:

- The original lines $-2x + y = 0$ and $-7x + 3y = 2$ intersect at a point, which is the solution to the system.
- The difference equation $5x - 2y = -2$ represents a line that can be used to determine this intersection point by combining it with other related equations.

Solving the System Using the Derived Equation

The new equation $5x - 2y = -2$ can be used alongside the original equations to find the solution.

Method 1: Substitution

1. Solve for y in terms of x using the new equation:

$$
5x - 2y = -2 \implies -2y = -5x - 2 \implies y = \frac{5x + 2}{2}
$$

2. Substitute this expression into one of the original equations, say, $-2x + y = 0$:

$$
-2x + \left(\frac{5x + 2}{2} \right) = 0
$$

3. Multiply through by 2 to clear the denominator:

$$
-4x + 5x + 2 = 0
$$

4. Simplify:

$$
x + 2 = 0 \implies x = -2
$$

5. Find y:

$$
y = \frac{5(-2) + 2}{2} = \frac{-10 + 2}{2} = \frac{-8}{2} = -4
$$

Solution:

$$
\boxed{(x, y) = (-2, -4)}
$$

This point satisfies both the original equations, confirming the validity of the subtraction process.

Verifying the Solution

To ensure the solution is correct, substitute $(x, y) = (-2, -4)$ into both original equations:

- Equation 1: $-2(-2) + (-4) = 4 - 4 = 0$ (True)
- Equation 2: $-7(-2) + 3(-4) = 14 - 12 = 2$ (True)

Since both are satisfied, the solution is verified.

Applications and Importance of Subtracting Equations

Subtracting equations is a fundamental skill in algebra with numerous applications:

- Solving Systems of Equations: Simplifies the process of finding variable values.
- Analyzing Relationships: Helps understand how different equations relate to each other.
- Geometry: Assists in finding intersection points and distances between lines.
- Real-world Problems: Used in economics, engineering, physics, and other fields where multi-variable systems are common.

Advantages of subtraction method:

- Can eliminate a variable directly if coefficients are opposites.
- Provides an alternative to substitution when substitution becomes cumbersome.
- Facilitates understanding of the underlying relationships between equations.

Summary of Key Steps and Takeaways

1. Identify the equations you want to subtract.
2. Perform the subtraction carefully, distributing the minus sign and combining like terms.
3. Simplify the resulting equation to the standard form.
4. Use the new equation to find relationships between variables or to assist in solving the original system.

5. Verify the solution by substituting back into the original equations.

Main takeaway:
Subtracting the second equation from the first transforms the system into a new equation, $5x - 2y = -2$, which can be instrumental in solving for the variables and understanding the system's behavior.

Conclusion

Understanding what happens when you subtract one equation from another is a powerful tool in algebra. In the specific case of the system:

$$
-2x + y = 0 \\
-7x + 3y = 2
$$

subtracting the second from the first yields:

$$
5x - 2y = -2
$$

This new equation simplifies the process of solving for x and y, ultimately leading to the solution $(-2, -4)$. Mastery of this operation enhances problem-solving skills and deepens comprehension of the relationships between equations in a system. Whether in academic settings or practical applications, knowing how to manipulate and interpret such equations is essential for success in mathematics and related fields.

Frequently Asked Questions

What is the first step in subtracting the second equation from the first in the system -2x + y = 0 and -7x + 3y = 2?

The first step is to write both equations in a comparable form and then subtract the second equation from the first by subtracting their corresponding coefficients.

What is the result of subtracting the second

equation (-7x + 3y = 2) from the first (-2x + y = 0)?

Subtracting gives: (-2x - (-7x)) + (y - 3y) = 0 - 2, which simplifies to 5x - 2y = -2.

How do you perform the subtraction of two equations with variables?

Subtract corresponding coefficients of like terms: for x, subtract the second equation's coefficient from the first; do the same for y and constants.

What is the new equation obtained after subtracting the second from the first?

The resulting equation is 5x - 2y = -2.

Does subtracting equations help in solving the system of equations?

Yes, subtracting equations can help eliminate variables or create new equations that facilitate solving the system.

Can the new equation 5x - 2y = -2 be used directly to find the values of x and y?

Not directly; it is one of the many equations derived from the original system, and additional steps are needed to find x and y.

What is the purpose of subtracting the second equation from the first in algebra?

The purpose is to eliminate or reduce variables, making it easier to solve for one variable or analyze the system.

Is the subtraction of equations valid for solving systems of linear equations?

Yes, subtracting equations is a valid operation that can simplify the system and help find solutions.

Can you use the new equation 5x - 2y = -2 along with the original equations to find x and y?

Yes, you can use it with either of the original equations to solve for the variables using substitution or elimination methods.

What is the importance of understanding how to subtract equations in algebra?

Understanding subtraction of equations is crucial for solving systems, simplifying problems, and gaining insights into relationships between variables.

Additional Resources

What Is The Result Of Subtracting The Second Equation From The First? -2x + y = 0, -7x + 3y = 2

When solving systems of linear equations, one common method involves subtracting one equation from another to simplify and find the values of variables. In the case of the given equations:

- First equation: -2x + y = 0
- Second equation: -7x + 3y = 2

the question arises: What is the result of subtracting the second equation from the first? This process will help us understand how to manipulate equations to isolate variables and analyze relationships between them.

This article explores this operation in detail, providing a comprehensive understanding of the subtraction process, its implications, and how it can be used as a step toward solving the system.

Understanding the Equations

Before diving into the subtraction process, it’s essential to understand the structure of the two equations.

First Equation: -2x + y = 0

This equation can be interpreted as a linear relationship between variables x and y. It suggests that y can be expressed in terms of x:

$$ y = 2x $$

which indicates a direct proportionality between y and x.

Second Equation: -7x + 3y = 2

Similarly, this equation relates x and y with different coefficients and a constant term. We can rearrange this to express y in terms of x as well:

\[3y = 7x + 2 \]
\[y = \frac{7x + 2}{3} \]

Having these equations in a comparable form makes it easier to analyze their relationship, compare solutions, or perform operations like subtraction.

Performing the Subtraction

The core of this discussion is to subtract the second equation from the first:

\[
(-2x + y) - (-7x + 3y) = 0 - 2
\]

Let’s break this down step-by-step:

Step 1: Write the subtraction explicitly

\[
(-2x + y) - (-7x + 3y) = 0 - 2
\]

Step 2: Distribute the minus sign across the second equation

\[
-2x + y + 7x - 3y = -2
\]

This is because subtracting a negative is equivalent to adding its positive.

Step 3: Combine like terms

\[
(-2x + 7x) + (y - 3y) = -2
\]
\[
5x - 2y = -2

\]

This resulting equation encapsulates the difference between the two original equations.

Interpreting the Result: 5x - 2y = -2

The subtraction yields a new linear equation:

\[5x - 2y = -2 \]

This equation can be viewed as a relationship between x and y that reflects the difference between the original equations.

Features of the Resulting Equation:

- It is linear, representing a straight line in the xy-plane.
- It relates to the original equations by expressing their difference.
- It can be used as a step toward solving for specific values of x and y, especially within the context of the system.

Implications of the Result

- The equation can be rearranged to express y in terms of x:
\[
-2y = -5x - 2
\]
\[
y = \frac{5x + 2}{2}
\]
- It helps identify the relationship between the two original lines, such as whether they intersect, are parallel, or coincident.

Analyzing the Geometric Meaning

Understanding the subtraction’s result also involves a geometric perspective.

Graphical Interpretation
- Each original equation represents a line in the xy-plane.
- The equation obtained by subtracting the second from the first describes a new line, which can be interpreted as the difference of the positions of the original lines.

Parallel, Intersecting, or Coincident Lines
- The original lines may intersect at a point, indicating a unique solution.
- They might be parallel, indicating no solutions.
- Or they could be coincident, meaning they are the same line.

The difference equation, $5x - 2y = -2$, helps analyze the relative positions of the original lines by examining the slopes and intercepts.

Solving for Specific Values of x and y

The difference equation is useful for finding particular solutions or understanding the solution set.

Express y in terms of x:
$$
y = \frac{5x + 2}{2}
$$

This expression can be substituted back into either original equation to find specific solutions:

- Substitute into the first equation: $-2x + y = 0$

$$
-2x + \frac{5x + 2}{2} = 0
$$

Multiply through by 2 to clear denominators:

$$
-4x + 5x + 2 = 0
$$
$$
x + 2 = 0
$$
\[

$$
x = -2
$$

Now, substitute $x = -2$ into the expression for y:

$$
y = \frac{5(-2) + 2}{2} = \frac{-10 + 2}{2} = \frac{-8}{2} = -4
$$

Thus, the solution to the system derived from the subtraction process is:

$$
x = -2, \quad y = -4
$$

This point $(-2, -4)$ is the intersection point of the original lines, confirming the consistency of the subtraction method.

Pros and Cons of Subtracting Equations in System Solving

While subtracting equations is a straightforward technique, it has specific advantages and limitations.

Pros

- Simplifies the system by eliminating one variable if coefficients are aligned.
- Useful for quickly finding relationships between variables.
- Can reveal whether equations are parallel, intersecting, or the same.

Cons

- Requires the equations to be in compatible forms.
- Not always directly applicable if coefficients don't align or are not easily manipulated.
- May involve more steps if equations are complex or contain fractions.

Features of the Subtraction Method

- Versatility: Can be applied to various systems, especially when coefficients are aligned.
- Simplicity: Straightforward calculation that often leads to a direct solution.
- Complementary: Often used alongside substitution or elimination methods for efficiency.

Summary and Conclusion

Subtracting the second equation from the first, $-2x + y = 0$ and $-7x + 3y = 2$, results in the new linear equation:

$$
5x - 2y = -2
$$

This operation simplifies the problem by revealing the relationship between x and y that accounts for the difference between the original equations. The resulting equation can be used to find specific solutions for the variables, as demonstrated with the example solution $(x, y) = (-2, -4)$, which satisfies both the original equations.

The process underscores the importance of understanding linear combinations and their role in solving systems of equations. It demonstrates that subtraction is not merely an arithmetic operation but a powerful algebraic tool that can illuminate the structure of a system and facilitate finding solutions efficiently.

In conclusion, subtracting equations is a valuable step in the algebraic toolbox, offering clarity and simplicity when approaching linear systems. Whether used to find intersections, analyze relationships, or reduce the system, mastering this technique enhances problem-solving skills and deepens understanding of linear algebra concepts.

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