Need Help ASAP Please!!!y - 3 = 2xy + 4 = 3xIf You Use The Comparison Method To Solve The Given System,

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When tackling systems of equations, especially those involving multiple variables and complex expressions, choosing an effective method for solving is crucial. The comparison method is a powerful technique that helps in simplifying and solving such systems efficiently. If you are facing a problem involving the system of equations like y - 3 = 2xy + 4 = 3x, understanding how to apply the comparison method can make your task much easier. This guide provides a comprehensive explanation of the comparison method, its steps, and how to apply it to solve the given system effectively.

Understanding the System of Equations

Before diving into the solution process, it’s important to understand the structure of the given system. The equations provided are:

```
y - 3 = 2xy + 4 = 3x
```

This expression indicates that all these expressions are equal, which can be rewritten as:

```
y - 3 = 2xy + 4
```

and

```
2xy + 4 = 3x
```

In essence, the system consists of two equations:

1. y - 3 = 2xy + 4
2. 2xy + 4 = 3x

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

Applying the Comparison Method

The comparison method involves expressing one variable in terms of the other from one of the equations, then substituting into the other to find specific solutions. Here's a step-by-step approach:

Step 1: Simplify the Equations

Start by rewriting both equations in a more manageable form.

Equation 1:

$$y - 3 = 2xy + 4$$

Bring all terms to one side:

$$y - 3 - 2xy - 4 = 0$$

Simplify:

$$y - 2xy - 7 = 0$$

Equation 2:

$$2xy + 4 = 3x$$

Rearranged:

$$2xy = 3x - 4$$

Step 2: Express y in terms of x

From the second equation:

$$2xy = 3x - 4$$

Assuming $x \neq 0$, divide both sides by 2x:

$$y = (3x - 4) / (2x)$$

This expression for y can now be substituted into the first simplified equation.

Step 3: Substitute y into the first equation

Recall the simplified first equation:

$$y - 2xy - 7 = 0$$

Substitute y:

$$[(3x - 4) / (2x)] - 2x \quad [(3x - 4) / (2x)] - 7 = 0$$

Simplify each term:

- First term: (3x - 4) / (2x)

- Second term: $2x [(3x - 4) / (2x)] = (2x) (3x - 4) / (2x) = 3x - 4$

Putting it all together:

$$(3x - 4) / (2x) - (3x - 4) - 7 = 0$$

Step 4: Clear denominators and solve for x

Multiply the entire equation by $2x$ to eliminate the denominator:

$$(3x - 4) - (3x - 4) \;\; 2x - 7 \;\; 2x = 0$$

Expand:

- First term: $(3x - 4)$
- Second term: $(3x - 4) 2x$
- Third term: $14x$

Rewrite the equation:

$$(3x - 4) - 2x \;\; (3x - 4) - 14x = 0$$

Calculate each:

- $(3x - 4)$
- $2x (3x - 4) = 6x^2 - 8x$

So:

$$(3x - 4) - (6x^2 - 8x) - 14x = 0$$

Distribute the negative:

$$3x - 4 - 6x^2 + 8x - 14x = 0$$

Combine like terms:

$$-6x^2 + (3x + 8x - 14x) - 4 = 0$$

which simplifies to:

$$-6x^2 - 3x - 4 = 0$$

Multiply through by -1 to make the quadratic standard:

$$6x^2 + 3x + 4 = 0$$

Step 5: Solve the quadratic equation

Apply the quadratic formula:

$$x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$$

where $a = 6$, $b = 3$, $c = 4$.

Calculate discriminant:

$$D = b^2 - 4ac = (3)^2 - 4 \quad 6 \quad 4 = 9 - 96 = -87$$

Since the discriminant is negative, there are no real solutions for x, indicating that the system has no real solutions.

Note: If complex solutions are acceptable, proceed with complex number calculations.

Interpreting the Results

The negative discriminant suggests that the original system of equations has no real solutions. This is an important insight because it tells you about the nature of the solutions—either real or complex.

In case of complex solutions:

- x would be complex numbers involving $\sqrt{(-87)}$.
- y can then be found using the expression $y = (3x - 4) / (2x)$.

Summary of the Comparison Method Steps

To recap, here's a quick overview of the comparison method applied to this system:

1. Simplify the given equations and identify relationships.

2. Express one variable in terms of the other from one of the equations.

3. Substitute this expression into the other equation to obtain a quadratic or simpler equation.
4. Solve the resulting quadratic equation to find possible values of one variable.
5. Back-substitute to find corresponding values of the other variable.
6. Interpret the solutions, considering whether they are real or complex.

Additional Tips for Using the Comparison Method

- Always verify the domain restrictions, such as denominators not being zero.
- When the quadratic discriminant is negative, consider whether complex solutions are acceptable.
- If the substitution leads to complicated expressions, consider alternative methods like substitution or elimination for verification.

Conclusion

The comparison method is a systematic approach to solving systems of equations, especially useful when one variable can easily be isolated. In the case of the system involving y - 3 = 2xy + 4 = 3x, applying the comparison method led to a quadratic equation with no real solutions, illustrating its effectiveness in analyzing the nature of solutions. With practice, this method becomes an invaluable tool in your algebraic toolkit, allowing you to handle complex systems with confidence and clarity. Remember to always interpret your solutions within the context of the problem, and consider all possible types of solutions, including complex ones when necessary.

Frequently Asked Questions

How do I interpret the system of equations 3 = 2xy + 4 = 3x when using the comparison method?

When given equations like 3 = 2xy + 4 = 3x, it indicates that 2xy + 4 and 3x are equal to 3 and to each other. To use the comparison method, set 2xy + 4 equal to 3x and solve for one variable in terms of the other, then substitute back into the equations to find the solution.

What are the steps to solve the system 3 = 2xy + 4 = 3x using the comparison method?

First, recognize that 2xy + 4 = 3x and both equal 3. Set 2xy + 4 = 3x and solve for y: 2xy = 3x - 4, then divide both sides by 2x (assuming x ≠ 0) to find y = (3x - 4)/(2x). Next, substitute y into the first equation (if needed) to find the value of x, and then determine y.

Can I use substitution after comparing the equations in this system?

Yes, after using the comparison method to relate the variables, you can substitute the expression for one variable into the other equations to solve for the remaining variables, streamlining the solution process.

What common mistakes should I avoid when using the comparison method on this system?

Be careful to verify that the variables you divide by are not zero to avoid undefined expressions. Also, ensure that you set the equations correctly and do not mix up the equalities. Double-check your substitutions and algebraic manipulations for accuracy.

Is the comparison method effective for solving nonlinear systems like the one given?

Yes, the comparison method can be effective for certain nonlinear systems by equating expressions and solving step-by-step. However, it requires careful manipulation and may sometimes be more complex than other methods like substitution or elimination, depending on the system's structure.

Additional Resources

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In the realm of algebra, solving systems of equations is a fundamental skill that bridges understanding complex relationships between variables. When confronted with a system that appears tangled or unconventional, mathematicians and students alike often turn to various methods for clarity. One such approach is the comparison method, a technique that involves rewriting equations to facilitate direct comparison and ultimately, solution. Today, we delve into a specific system of equations:

$y - 3 = 2xy + 4 = 3x$

At first glance, this statement may seem perplexing or even incorrect—after all, it resembles a chain of equalities rather than separate equations. However, with careful interpretation, it becomes a manageable system to analyze and solve. This article will guide you through understanding the structure, applying the comparison method, and arriving at the solution with clarity and confidence.

Understanding the System: Deciphering the Equations

Before diving into the comparison method, it’s crucial to interpret the given system correctly.

Interpreting the Statement

The expression:

$y - 3 = 2xy + 4 = 3x$

may be read as a chain of equalities, which implies:

- $y - 3 = 2xy + 4$
- $2xy + 4 = 3x$

Effectively, these are two separate equations:

1. $y - 3 = 2xy + 4$
2. $2xy + 4 = 3x$

This interpretation aligns with common algebraic conventions where chained equalities link multiple expressions.

Step 1: Isolate and Simplify Each Equation

Let's first write each as a standard form to facilitate comparison.

Equation 1: $y - 3 = 2xy + 4$

Rearranged as:

$y - 3 = 2xy + 4$

Subtract 4 from both sides:

$y - 7 = 2xy$

Expressed as:

$y - 7 = 2xy$

This equation involves both y and xy terms. To manage it, we can bring all to one side:

$y - 7 - 2xy = 0$

Equation 2: $2xy + 4 = 3x$

Rearranged as:

$2xy + 4 = 3x$

Subtract 4:

$2xy = 3x - 4$

Now, the goal is to find the values of x and y satisfying both equations simultaneously.

Step 2: Express One Variable in Terms of the Other

The comparison method benefits from expressing one variable in terms of the other. Let's analyze Equation 2:

$2xy = 3x - 4$

Assuming $x \neq 0$, divide both sides by 2x:

$y = (3x - 4) / (2x)$

This gives an explicit expression for y in terms of x:

$y = (3x - 4) / (2x)$

Step 3: Substitute into the First Equation

Recall from earlier:

$y - 7 - 2xy = 0$

Substitute y:

$y = (3x - 4) / (2x)$

Calculate 2xy:

$2x y = 2x [(3x - 4) / (2x)] = (2x (3x - 4)) / (2x)$

Since 2x cancels out:

$2x y = 3x - 4$

Now, rewrite the first equation:

$y - 7 - (3x - 4) = 0$

Substitute y:

$(3x - 4) / (2x) - 7 - (3x - 4) = 0$

Step 4: Simplify and Solve for x

Our goal now is to find x satisfying this equation.

Combine terms:

$(3x - 4) / (2x) - 7 - (3x - 4) = 0$

Let's write all terms over a common denominator or clear fractions:

Multiply through by 2x to eliminate the denominator:

$(3x - 4) - 7\ 2x - (3x - 4)\ 2x = 0$

Calculations:

- First term: $(3x - 4)$
- Second term: $-14x$
- Third term: $(3x - 4)\ 2x$

Calculate the third term:

$(3x - 4)\ 2x = 2x\ 3x - 2x\ 4 = 6x^2 - 8x$

Now, rewrite the entire equation:

$(3x - 4) - 14x - (6x^2 - 8x) = 0$

Distribute the negative:

$(3x - 4) - 14x - 6x^2 + 8x = 0$

Combine like terms:

- For x terms:

$3x - 14x + 8x = (3 - 14 + 8)\ x = (-3)\ x$

- For constants:

-4

- For quadratic term:

$-6x^2$

Putting it all together:

$-6x^2 - 3x - 4 = 0$

Step 5: Solve the Quadratic Equation

The quadratic:

$-6x^2 - 3x - 4 = 0$

Divide through by -1 to simplify:

$6x^2 + 3x + 4 = 0$

Apply the quadratic formula:

$x = [-b \pm \sqrt{b^2 - 4ac}] / (2a)$

where:

$a = 6$

$b = 3$

$c = 4$

Calculate discriminant:

$D = b^2 - 4ac = 9 - 4\ 6\ 4 = 9 - 96 = -87$

Since $D < 0$, there are no real solutions for x.

Implication: No Real Solution Exists

The negative discriminant indicates that the system has no real solutions under the current assumptions. This suggests that the equations do not intersect in the real number plane, and the system is inconsistent in real terms.

Special Note: Complex Solutions

If complex solutions are acceptable, you can proceed to compute:

$x = [-3 \pm \sqrt{-87}] / (12)$

Recall:

$\sqrt{-87} = i\sqrt{87}$

So,

$x = [-3 \pm i\sqrt{87}] / 12$

Correspondingly, y can be found using:

$y = (3x - 4) / (2x)$

Substituting x into this expression would yield complex values for y as well.

Summary of the Solution Process

1. Interpreted the chain of equalities as two separate equations.
2. Rearranged equations to express one variable in terms of the other.
3. Substituted the expression for y into the first equation to get a quadratic in x.
4. Solved the quadratic, found that the discriminant is negative, implying no real solutions.
5. Noted that complex solutions exist, which involve imaginary numbers.

Conclusion: The Power and Limitations of the Comparison Method

The comparison method proved effective in this scenario by:

- Rewriting the system to express one variable in terms of the other.
- Substituting to reduce the system to a single-variable quadratic.
- Quickly assessing the nature of solutions via the discriminant.

However, it also highlights a crucial aspect: the method's reliance on the ability to express one variable explicitly and the nature of the resulting quadratic. When the discriminant is negative, it signals that solutions may be complex or nonexistent in real numbers.

In practical terms, the comparison method is a valuable tool for solving systems, especially when equations can be manipulated into comparable forms. It simplifies the process by reducing the system to a single equation, making the path to solutions more straightforward. Yet, it’s essential to remain aware of the system's properties and the potential for complex solutions.

Final Thoughts

Whether you're a student tackling algebraic systems or a professional mathematician, understanding the comparison method's nuances can greatly enhance problem-solving efficiency. In this specific case, the method revealed the absence of real solutions, guiding further exploration into complex number solutions. Armed with these insights, you are better equipped to approach similar systems with confidence, clarity, and a methodical mindset.

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