Is (5, 0.5) A Solution Of This System?x 4y = 7,0.2x 2y = 0substitute (5, 0.5) Into X 4y = 7 To Get .substitute

Is (5, 0.5) A Solution Of This System?x 4y = 7,0.2x 2y = 0substitute

Determining whether a particular point satisfies a system of equations is a fundamental concept in algebra and coordinate geometry. In this article, we will explore the process of verifying if the point (5, 0.5) is a solution to the system of equations:

1. \(x \cdot 4y = 7 \)
2. \(0.2x \cdot 2y = 0 \)

We will delve into the step-by-step substitution process, interpret the results, and discuss the significance of solutions in understanding systems of equations. This comprehensive guide aims to strengthen your algebraic skills and clarify the methods used to verify solutions.

Understanding Systems of Equations

What Is a System of Equations?

A system of equations consists of two or more equations with the same set of variables. The solutions to the system are the values of these variables that satisfy all equations simultaneously.

Why Test Solutions?

Testing whether a point satisfies a system helps identify solutions graphically and analytically. It confirms whether a specific coordinate point lies at the intersection of the equations' graphs.

The Given System of Equations

Let's revisit the system:

\[
\begin{cases}
x \cdot 4y = 7 \quad \text{(Equation 1)} \\
0.2x \cdot 2y = 0 \quad \text{(Equation 2)}
\end{cases}

\]

Note: The second equation can be simplified for clarity.

Simplifying the Second Equation

The second equation is:

\[
0.2x \cdot 2y = 0
\]

Multiplying out:

\[
(0.2 \times 2) \times x y = 0
\]

\[
0.4 xy = 0
\]

Dividing both sides by 0.4 (since 0.4 ≠ 0):

\[
xy = 0
\]

This simplified form makes it clear that the second equation states that the product of \(x \) and \(y \) must be zero.

Substituting the Point (5, 0.5) into the Equations

Now, to verify whether the point (5, 0.5) is a solution, we substitute \(x = 5 \) and \(y = 0.5 \) into each equation.

Substitution into Equation 1: \(x \cdot 4y = 7 \)

Let's perform the substitution:

\[
x = 5, \quad y = 0.5
\]
\[
\text{Left Side} = 5 \times 4 \times 0.5
\]

Calculating:

$$
4 \times 0.5 = 2
$$
$$
5 \times 2 = 10
$$

Compare with the right side:

$$
\text{Left Side} = 10 \neq 7
$$

Since 10 does not equal 7, the point (5, 0.5) does not satisfy Equation 1.

Substitution into Equation 2: $xy = 0$

Substitute:

$$
x = 5, \quad y = 0.5
$$
$$
xy = 5 \times 0.5 = 2.5
$$

Compare with the right side:

$$
xy = 2.5 \neq 0
$$

Thus, the point (5, 0.5) does not satisfy Equation 2 either.

Interpreting the Results

Since the point (5, 0.5) does not satisfy either equation in the system, it is not a solution to the system.

- Equation 1: The point yields 10, which is not equal to 7.
- Equation 2: The point yields 2.5, which is not equal to 0.

Therefore, the point (5, 0.5) does not lie at the intersection of the lines represented by these equations.

Understanding the Significance of the Results

Solutions to Systems of Equations

Solutions are the points where all equations in a system are satisfied simultaneously. These points are often visualized as intersections of lines or curves on a graph.

Implications of the Findings

Since (5, 0.5) fails to satisfy both equations, it does not represent a common solution or intersection point. This indicates that the point is outside the feasible region defined by the system.

Additional Insights and Related Concepts

Graphical Interpretation

- Equation 1: $x \times 4y = 7$ can be rewritten as $y = \frac{7}{4x}$, which is a hyperbola.
- Equation 2: $xy = 0$ implies either $x = 0$ or $y = 0$, representing the x-axis and y-axis.

Plotting these would show that the solutions to the second equation are solely along the axes, while the first is a hyperbola that does not pass through (5, 0.5).

Special Cases

- If a point satisfies all equations, it is a solution.
- If even one equation is not satisfied, the point is not a solution.

How to Systematically Verify Solutions

Here's a step-by-step approach:

1. Identify the equations and simplify if necessary.
2. Substitute the x and y values from the point into each equation.
3. Calculate the left side of each equation after substitution.
4. Compare the results with the right side of each equation.

5. Determine if all equations are satisfied simultaneously.

Applying this method ensures a consistent and reliable way to verify solutions.

Conclusion

In conclusion, the point (5, 0.5) is not a solution to the system:

\[
\begin{cases}
x \cdot 4y = 7 \\
0.2x \cdot 2y = 0
\end{cases}
\]

because substituting the point into the equations does not satisfy either one. Understanding how to verify solutions through substitution is a vital skill in algebra, aiding in graphing, solving, and interpreting systems of equations.

This exercise highlights the importance of careful substitution and interpretation, essential for students and professionals working with algebraic systems. Whether you're solving for unknowns, analyzing intersections, or modeling real-world problems, mastering these techniques will enhance your mathematical proficiency.

Keywords: solution of system of equations, substitution method, algebra, verify solutions, coordinate geometry, systems of equations, algebraic verification, point solution, solving equations, systems of linear equations

Frequently Asked Questions

Is the point (5, 0.5) a solution to the system x 4y = 7 and 0.2x 2y = 0?

To determine if (5, 0.5) is a solution, substitute x=5 and y=0.5 into both equations and check if they hold true.

How do you verify if a point satisfies a system of equations?

Substitute the point's coordinates into each equation and see if both equations are true with those values.

What is the result of substituting (5, 0.5) into x 4y = 7?

Substituting x=5 and y=0.5 gives 5 4 0.5 = 7, which simplifies to 5 2 = 7, or 10 = 7, which is false.

Does the point (5, 0.5) satisfy the second equation 0.2x 2y = 0?

Substituting x=5 and y=0.5 into 0.2x 2y = 0 gives 0.2 5 2 0.5 = 0, which simplifies to 0.2 5 1 = 0, or 1 = 0, which is false.

Based on the substitutions, is (5, 0.5) a solution to the entire system?

No, because the point does not satisfy either of the equations after substitution.

What is the correct method to check if (5, 0.5) solves the system?

Calculate each equation's left side after substitution; if both equal the right side, the point is a solution. Since neither does, (5, 0.5) is not a solution.

Additional Resources

Is (5, 0.5) a Solution of the System? An In-Depth Analysis of Substitution Method and System Verification

In the realm of algebra, particularly when dealing with systems of equations, determining whether a specific point is a solution is a fundamental skill. The question of whether the ordered pair (5, 0.5) satisfies a given system of equations involves a detailed process of substitution and verification. This article offers a comprehensive exploration of this process, focusing on the system:

\[
\begin{cases}
x + 4y = 7 \\
0.2x + 2y = 0
\end{cases}
\]

and the candidate point (5, 0.5). We will analyze the steps necessary to confirm whether this point is indeed a solution, elucidate the substitution process, and interpret the implications of the results. This review aims to serve students, educators, and anyone interested in the logical procedures behind solving systems of equations.

Understanding the System of Equations

Before diving into substitution and verification, it's essential to understand the nature of the system at hand.

Formulation of the System

The system consists of two linear equations:

1. $x + 4y = 7$ — a straightforward linear equation representing a line in the xy-plane.
2. $0.2x + 2y = 0$ — another linear equation, which, when simplified, can reveal the relationship between x and y.

The primary question is: does the point (5, 0.5) satisfy both equations simultaneously? If it satisfies both, it is a solution; if not, it isn't.

Why Is This Important?

Verifying solutions is a core aspect of algebra because:

- It helps in solving systems graphically by checking if a point lies at the intersection of lines.
- It aids in understanding the consistency of equations.
- It reinforces the concept of substitution as a method of solution.

Substitution Method: A Step-by-Step Approach

The substitution method involves replacing variables in an equation with known values from a candidate solution to test its validity.

Step 1: Isolate one variable (if necessary)

In this case, since the candidate point is already given, we can directly substitute $x = 5$ and $y = 0.5$ into both equations.

Step 2: Substitute into the first equation $x + 4y = 7$

- Substituting $x = 5$ and $y = 0.5$:

$$
5 + 4 \times 0.5
$$

- Calculating:

$$
5 + 4 \times 0.5 = 5 + 2 = 7
$$

- Since the left side equals the right side (7), the point satisfies the first equation.

Step 3: Substitute into the second equation $0.2x + 2y = 0$

- Substitute $x = 5$ and $y = 0.5$:

$$
0.2 \times 5 + 2 \times 0.5
$$

- Calculating:

$$
(0.2 \times 5) + (2 \times 0.5) = 1 + 1 = 2
$$

- The sum is 2, which does not equal 0, indicating the point does not satisfy the second equation.

Interpreting the Results of the Substitution

The substitution process reveals crucial information:

- The point (5, 0.5) satisfies the first equation but fails to satisfy the second.
- Therefore, (5, 0.5) is not a solution of the entire system because solutions must satisfy all equations simultaneously.
- This discrepancy indicates that the point lies on the line represented by the first equation but not on the line represented by the second.

Implications and Broader Context

Understanding whether a point is a solution to a system provides insights into the geometric and algebraic relationships between equations.

Graphical Interpretation

- The first equation $x + 4y = 7$ can be rewritten as $y = \frac{7 - x}{4}$, representing a line.
- The second equation $0.2x + 2y = 0$ simplifies to:

$$
0.2x + 2y = 0 \Rightarrow \text{Divide through by 0.2:} \quad x + 10y = 0
$$

which can be rearranged as:

$$
y = -\frac{x}{10}
$$

- Plotting these two lines shows they intersect at a point different from (5, 0.5). Since (5, 0.5) does not satisfy both, it is not their intersection point.

Algebraic Significance

- The failure to satisfy both equations simultaneously indicates the system is inconsistent at this point.
- The solution set for the system is the intersection of the two lines, which can be found algebraically by solving the system.

Finding the Actual Solution

To identify the true solution, one can solve the system:

1. From the second equation:

$$
x + 10y = 0 \quad \Rightarrow \quad x = -10y
$$

2. Substitute into the first equation:

\[

$$
-10y + 4y = 7
$$

$$
-6y = 7
$$

$$
y = -\frac{7}{6} \approx -1.1667
$$

3. Find x:

$$
x = -10 \times -\frac{7}{6} = \frac{70}{6} = \frac{35}{3} \approx 11.6667
$$

Thus, the actual solution to the system is approximately (11.67, -1.17), which differs significantly from the candidate point (5, 0.5).

Conclusion: Is (5, 0.5) a Solution? Final Thoughts

Based on the substitution analysis, (5, 0.5) does not satisfy the system $x + 4y = 7$ and $0.2x + 2y = 0$. While it meets the first equation, it fails to satisfy the second, demonstrating the importance of checking all equations in a system.

This exercise underscores several critical lessons:

- The substitution method is an effective way to verify potential solutions.
- Solutions to systems must satisfy all equations simultaneously.
- Graphically, solutions are the intersection points of the lines represented by the equations.
- Algebraically, solving the system provides the actual points of intersection, which in this case differ from the candidate point.

In broader terms, such verification serves as a fundamental step in solving systems, whether for mathematical reasoning, engineering applications, or data analysis. The process exemplifies careful logical reasoning, meticulous calculation, and the importance of cross-checking results—a hallmark of rigorous mathematical practice.

Final verdict: No, (5, 0.5) is not a solution to the system $x + 4y = 7$ and $0.2x + 2y = 0$. The true solution lies elsewhere, emphasizing the necessity of thorough substitution and solving to confirm solutions accurately.

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