Given 7(x, Y) = (x + 5, Y + 4) And The Point P (2, 3), What Is 7(P)? Please Show Work So Sorry

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Understanding how functions transform points in the coordinate plane is fundamental in mathematics, especially in algebra and geometry. In this article, we will explore how to evaluate the function 7(x, y) = (x + 5, y + 4) at a specific point P(2, 3). We will walk through each step meticulously to clarify the process, ensuring a comprehensive understanding of function evaluation, coordinate transformations, and application of the given function.

Understanding the Function 7(x, y) = (x + 5, y + 4)

Before applying the function to the point P(2, 3), it is essential to understand what the function represents and how it operates on input points.

What Does the Function Do?

The function 7(x, y) = (x + 5, y + 4) takes an input point with coordinates (x, y) and outputs a new point by adding 5 to the x-coordinate and adding 4 to the y-coordinate. This kind of function is called a translation, which shifts a point in the coordinate plane by a specific amount along the x and y axes.

Key Points:

- The function adds 5 to the x-coordinate.
- The function adds 4 to the y-coordinate.
- The transformation is uniform and applies to any point (x, y).

Visualizing the Transformation

Imagine a point P in the coordinate plane. Applying the function moves the point rightward by 5 units (since adding 5 to x moves the point along the x-axis) and upward by 4 units (adding 4 to y moves the point along the y-axis).

Evaluating the Function at Point P(2, 3)

Given the point P(2, 3), the goal is to find 7(P), which involves substituting the coordinates of P into the function.

Step-by-Step Work

Let's detail each step involved in evaluating 7(P):

1. Identify the coordinates of point P:
   - $x = 2$
   - $y = 3$

2. Write the function explicitly:
   - $7(x, y) = (x + 5, y + 4)$

3. Substitute the point's coordinates into the function:
   - $x = 2$
   - $y = 3$
4. Compute the new x-coordinate:
   - $x + 5 = 2 + 5 = 7$
5. Compute the new y-coordinate:
   - $y + 4 = 3 + 4 = 7$
6. Write the transformed point:
   - $7(P) = (7, 7)$

Result: The image of point P under the transformation 7 is (7, 7).

Interpreting the Result

The output point (7, 7) indicates that applying the function to P(2, 3) shifts it 5 units to the right and 4 units upward. This aligns with the translation interpretation of the function.

Graphical Representation

Visualizing this on a coordinate plane can deepen understanding:

- Original point P(2, 3) is located 2 units along the x-axis and 3 units along the y-axis.
- The transformed point (7, 7) is located 7 units along the x-axis and 7 units along the y-axis.
- The movement from P to 7(P) involves moving right by 5 units and up by 4 units.

Additional Insights into Function Transformations

Understanding this simple translation provides a foundation for more complex transformations, such as rotations, reflections, and dilations.

Translation as a Function

The function 7(x, y) = (x + 5, y + 4) is a translation that can be summarized as:

- Moving every point in the plane 5 units right.
- Moving every point 4 units up.

This kind of function is called a vector translation, where the vector (5, 4) indicates the direction and magnitude of the shift.

General Form of Translations

Translations in the coordinate plane can generally be expressed as:

$$
T_{a, b}(x, y) = (x + a, y + b)
$$

where:

- a is the horizontal shift (positive for right, negative for left).
- b is the vertical shift (positive for up, negative for down).

In our case:

$$
7(x, y) = T_{5, 4}(x, y)
$$

Real-World Applications of Coordinate Transformations

Understanding how to evaluate and interpret transformations like the one described has many practical applications:

- Computer Graphics: Moving images or objects within a scene.
- Robotics: Calculating positions after movements.
- Navigation: Transforming coordinate data for maps.
- Physics: Analyzing motion and displacement.

Example: Moving a Point in Design Software

Suppose a graphic designer needs to move an element from position (2, 3) to a new position by applying a shift of (5, 4). Knowing how to evaluate the transformation allows precise placement of objects in digital design.

Summary and Key Takeaways

- The function 7(x, y) = (x + 5, y + 4) performs a translation by adding 5 to x and 4 to y.
- To evaluate 7 at a point P(2, 3), substitute the coordinates into the function.
- The result, (7, 7), shows the point moved 5 units right and 4 units up.
- Understanding such transformations is fundamental in various mathematical and real-world contexts.

Final Note:

Mastering the evaluation of functions like this not only enhances algebraic skills but also improves spatial reasoning—a key component in many STEM fields.

In conclusion, applying the function 7(x, y) = (x + 5, y + 4) to the point P(2, 3) results in the new point (7, 7), achieved by straightforward substitution and addition. This process exemplifies basic translation transformations and their significance in coordinate geometry.

If you have further questions or need additional examples, feel free to ask!

Frequently Asked Questions

What does the transformation 7(x, y) = (x + 5, y + 4) represent?

It represents a translation of any point (x, y) by moving it 5 units to the right and 4 units up.

Given the point P (2, 3), how do you find 7(P) using the transformation?

Substitute x = 2 and y = 3 into the transformation: 7(2, 3) = (2 + 5, 3 + 4).

What is the result of 7(2, 3)?

7(2, 3) = (7, 7).

Can you show the step-by-step calculation for 7(P) where P = (2, 3)?

Yes. Step 1: Take x = 2, y = 3. Step 2: Apply the transformation: (2 + 5, 3 + 4). Step 3: Simplify to get (7, 7).

What is the significance of the transformation parameters +5 and +4?

They indicate the amount of horizontal and vertical shift applied to the original point, respectively.

Is the transformation 7(x, y) = (x + 5, y + 4) linear? Why or why not?

No, it is not a linear transformation because it involves translation (adding constants), which is an affine transformation, not a linear one.

If the point P is moved by 7, what is the new coordinate point?

The new coordinate point is (7, 7), after applying the transformation.

How does understanding transformations help in coordinate geometry?

Transformations help visualize and analyze how points move in space, making it easier to understand geometric relationships and solve problems involving translations, rotations, and other transformations.

What other types of transformations are common besides translation?

Other common transformations include rotation, reflection, scaling, and shear, each altering the position or size of geometric figures in different ways.

Additional Resources

Given 7(x, y) = (x + 5, y + 4) and the point P(2, 3), what is 7(P)? This question explores fundamental concepts in functions and transformations in mathematics, specifically focusing on how a given function acts on a particular point. Understanding how to evaluate a function at a specific point is a core skill in algebra and helps build a foundation for more complex topics like functions, transformations, and linear algebra. In this article, we'll thoroughly analyze the given function, break down the steps to find 7(P), and clarify common misunderstandings along the way.

Understanding the Function 7(x, y)

Before we jump into the calculations, it’s essential to understand what the function 7(x, y) represents. The function is defined as:

7(x, y) = (x + 5, y + 4)

This is a transformation that takes an input point (x, y) and produces a new point (x + 5, y + 4). Geometrically, this transformation shifts any point in the plane 5 units to the right and 4 units upward.

Key Characteristics of the Function

- Type of transformation: It is a translation, moving points without changing their size, shape, or orientation.
- Effect on points: Every point (x, y) is mapped to (x + 5, y + 4).

- Linearity: Not linear in the algebraic sense (since it includes constants), but it’s an affine transformation.

Step-by-Step Guide to Find 7(P), where P(2, 3)

Given a point P(2, 3), our goal is to evaluate 7(P). To do this, we'll follow a systematic approach.

Step 1: Identify the Components

- The point P has coordinates:
- $x = 2$
- $y = 3$

- The function 7(x, y) indicates the transformation:
- $x' = x + 5$
- $y' = y + 4$

Step 2: Substitute the Coordinates into the Function

Apply the transformation to the point:

- $x' = 2 + 5$
- $y' = 3 + 4$

Step 3: Perform the Calculations

- $x' = 2 + 5 = 7$
- $y' = 3 + 4 = 7$

Step 4: Write the Result

The transformed point 7(P) is:

(7, 7)

Summary of the Process

Step	Action	Calculation	Result
1	Identify the point's coordinates	P = (2, 3)	(2, 3)
2	Write the transformation rules	7(x, y) = (x + 5, y + 4)	–
3	Substitute x and y	x = 2, y = 3	–
4	Calculate new x and y	x' = 2 + 5 = 7, y' = 3 + 4 = 7	(7, 7)

Visualizing the Transformation

To better understand the effect of the function, imagine the point P(2, 3) plotted on a coordinate plane. When applying 7, the point shifts:

- 5 units to the right (increase in x-coordinate)
- 4 units upward (increase in y-coordinate)

This results in the point (7, 7), which is directly adjacent to the original point, moved by the specified translation.

Additional Examples

To reinforce understanding, let's examine a few more points:

Example 1: Point Q(0, 0)

- Q' = (0 + 5, 0 + 4) = (5, 4)
- The point moves from the origin to (5, 4).

Example 2: Point R(-3, 2)

- R' = (-3 + 5, 2 + 4) = (2, 6)
- The point moves from (-3, 2) to (2, 6).

Common Questions and Clarifications

1. Is the function 7(x, y) linear?

While the notation resembles a linear transformation, because it involves addition of constants, it’s technically an affine transformation. Linear transformations satisfy T(kx, ky) = kT(x, y) and T(0, 0) = (0, 0). Since 7(0, 0) = (5, 4) (not the origin), this transformation is not linear but affine.

2. Can the function be written as a matrix?

Yes. The translation part (adding 5 and 4) can be represented using matrix and vector addition:

[x'] = [1 0][x] + [5]

[y'] [0 1][y] [4]

In matrix form, the linear part is the identity matrix, and the translation is added afterwards.

3. How does this relate to other transformations?

This transformation is similar to shifting or translating the entire coordinate plane by the vector (5, 4).

Summary and Final Thoughts

- The function 7(x, y) = (x + 5, y + 4) is a translation that shifts points 5 units right and 4 units up.
- To evaluate 7(P) for a specific point P(x, y), substitute the coordinates into the transformation rules.
- For P(2, 3), 7(P) = (7, 7).
- Understanding how to evaluate points under functions is essential for grasping more advanced topics in algebra and geometry.

Closing Remarks

Mastering the process of transforming points using functions like 7(x, y) is a foundational skill in mathematics. Whether dealing with simple translations or complex linear transformations, the key is to understand the rules and practice applying them systematically. This knowledge not only helps in solving algebraic problems but also prepares you for more advanced subjects like vector spaces, affine transformations, and computer graphics.

Remember: Whenever faced with a transformation function, always identify the rule, substitute the point's coordinates, and perform the calculations carefully. With practice, this process becomes second nature, enabling you to analyze and visualize transformations with confidence.

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