Consider The Two Functions Given Below. F(x)= -3x+5 G(x)= F(x)+9 What Is The Y-intercept Of G? A. (0,9)

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Understanding the concepts of functions, especially linear functions, is essential for mastering algebra and related mathematical disciplines. In this article, we will analyze two functions, F(x) = -3x + 5 and G(x) = F(x) + 9, to determine the y-intercept of G. This exploration will not only help you find the specific point where G crosses the y-axis but will also deepen your comprehension of how functions relate to each other and how to interpret their graphs.

Introduction to Functions and Their Graphs

In mathematics, a function describes a relationship between an input and an output, often represented as f(x). When graphing functions, we plot points (x, f(x)) on the coordinate plane to visualize this relationship. For linear functions, the graph is a straight line characterized by its slope and y-intercept.

What Is a Y-Intercept?

The y-intercept of a function is the point where its graph crosses the y-axis (vertical axis). At this point, the value of x is zero. Finding the y-intercept involves evaluating the function at x = 0.

Given Functions and Their Roles

Let's analyze the functions provided:

- **F(x) = -3x + 5**
- **G(x) = F(x) + 9**

Our goal is to determine the y-intercept of G, which requires understanding how G relates to F and how to evaluate G at x = 0.

Understanding F(x) = -3x + 5

This is a linear function with:

- Slope (m): -3
- Y-intercept (b): 5

Graphically, this line crosses the y-axis at (0, 5) and has a negative slope, indicating it decreases as x increases.

Understanding G(x) = F(x) + 9

G(x) is derived by adding 9 to F(x), which means G(x) is a vertically shifted version of F(x). Specifically, G(x) is shifted upward by 9 units.

Calculating the Y-Intercept of G

To find the y-intercept of G, evaluate G(x) at x = 0:

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G(0) = F(0) + 9
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Since F(x) = -3x + 5, then:

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F(0) = -3(0) + 5 = 0 + 5 = 5
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Therefore,

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G(0) = 5 + 9 = 14
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Thus, the y-intercept of G is at the point (0, 14).

Interpreting the Results

From our calculation:

- The point where G crosses the y-axis is at (0, 14).
- This is because G(x) is a vertical shift of F(x) by +9 units.
- The original y-intercept of F(x) was at (0, 5), and shifting upward by 9 moves it to (0, 14).

Common Mistakes and Clarifications

When solving problems like this, students often make some common errors:

1. **Confusing the y-intercept of F(x) with that of G(x):** Remember that G(x) is shifted vertically, so its y-intercept is different unless the shift is zero.
2. **Forgetting to evaluate at x=0:** The y-intercept always occurs at x=0, so plugging in x=0 is essential.
3. **Misinterpreting the added constant:** Adding 9 to the entire function shifts the graph upward by 9 units, affecting the y-intercept accordingly.

Real-World Applications of Linear Functions and Their Intercepts

Understanding how to find the y-intercept of a function has practical implications in various fields:

- **Economics:** Determining the starting point of a cost or revenue function.
- **Physics:** Identifying initial conditions such as initial velocity or position.
- **Biology:** Modeling growth rates where the intercept indicates the starting population.
- **Engineering:** Analyzing systems where initial states are crucial for understanding behavior.

Step-by-Step Summary for Finding the Y-Intercept of G

To summarize the process:

1. Identify the given functions: F(x) = -3x + 5 and G(x) = F(x) + 9.
2. Recognize that G(x) is a vertical shift of F(x) by +9 units.
3. Calculate F(0): 0, 5.
4. Add 9 to F(0) to find G(0): 5 + 9 = 14.
5. Conclude that the y-intercept of G is at (0, 14).

Final Answer and Explanation

Based on the calculations above, the y-intercept of G(x) = F(x) + 9 is at the point (0, 14). The multiple-choice options provided in typical quiz formats might include (0, 9), but that would be incorrect unless the function shifted downward, which it does not in this case. Instead, the correct y-intercept is at (0, 14).

Note: The answer choice (0, 9) might be a distractor or a common misconception, but the precise calculation confirms (0, 14) as the correct y-intercept.

Conclusion

Understanding how to manipulate and analyze linear functions is fundamental in algebra. Recognizing how transformations like vertical shifts affect key points such as the y-intercept enables students to interpret and graph functions accurately. By evaluating functions at specific points, especially x=0, you can determine intercepts efficiently and apply this knowledge across various scientific and practical contexts. Remember, for G(x) = F(x) + 9, the y-intercept is at (0, 14), confirming the shift upward of the original function F(x).

Keywords for SEO Optimization:

- Linear functions y-intercept
- How to find y-intercept of a function
- F(x) and G(x) functions explained
- Calculating y-intercept in algebra
- Vertical shift of functions
- Understanding function transformations
- Algebra practice problems
- Graphing linear functions
- Function analysis for beginners
- Mathematical concepts in real-world applications

Frequently Asked Questions

What is the explicit form of G(x) based on the given functions?

G(x) = F(x) + 9 = (-3x + 5) + 9 = -3x + 14.

How do you find the y-intercept of the function G(x)?

The y-intercept occurs when x = 0. Substitute x = 0 into G(x): G(0) = -3(0) + 14 = 14. So, the y-

intercept is (0, 14).

Is the answer provided in the options correct for the y-intercept of G(x)?

No, the y-intercept of G(x) is (0, 14), not (0, 9).

What is the slope of the function G(x)?

The slope of G(x) is -3, same as F(x), since G(x) = F(x) + 9 is a vertical shift.

How does adding 9 to F(x) affect the graph of G(x) compared to F(x)?

Adding 9 shifts the graph of F(x) upward by 9 units, changing the y-intercept but not the slope.

Additional Resources

Consider The Two Functions Given Below: F(x) = -3x + 5 and G(x) = F(x) + 9. This problem invites us to analyze the relationship between these two functions, ultimately leading to the determination of the y-intercept of G. Understanding how functions interact and how their properties relate is fundamental in algebra, making this a valuable exercise for mastering linear equations and their graphical interpretations.

Understanding the Given Functions

Before diving into the specific question about the y-intercept of G, it's important to understand the nature of the two functions provided.

Function F(x) = -3x + 5

This is a linear function expressed in slope-intercept form, y = mx + b, where:
- The slope (m) is -3, indicating that the line decreases as x increases.
- The y-intercept (b) is 5, meaning the line crosses the y-axis at (0, 5).

Features of F(x):
- Slope: -3, a relatively steep negative slope.
- Y-intercept: (0, 5), the point where the line crosses the y-axis.
- Graph shape: A straight line decreasing from left to right.

Function G(x) = F(x) + 9

This function is derived from F(x) by adding 9 to its output. In other words, G(x) is a vertical translation of F(x) upward by 9 units.

Features of G(x):
- Transformation: Vertical shift upward by 9 units.
- Relation to F(x): G(x) is essentially F(x) shifted vertically, which means:
G(x) = (-3x + 5) + 9 = -3x + 14.

This simplification makes it easier to analyze G(x) directly, as it is also a linear function with a clear slope and y-intercept.

Finding the Y-Intercept of G(x)

The y-intercept of a function is the point where the graph crosses the y-axis, which occurs when x = 0. To find this point for G(x), we substitute x = 0 into the function.

Calculating G(0)

Given:
G(x) = -3x + 14

Substituting x = 0:
G(0) = -3(0) + 14 = 0 + 14 = 14

Therefore, the y-intercept of G is at (0, 14).

Answer: The y-intercept of G is (0, 14).

This is a key insight because, although the initial problem statement suggests the answer might be (0, 9), the actual calculation based on the functions shows that the y-intercept is at (0, 14).

Implications and Clarifications

The initial question seems to ask: "What is the y-intercept of G?" with options like (0, 9). However, based on the given functions and their algebraic manipulations, the y-intercept is at (0, 14). This discrepancy highlights the importance of carefully analyzing the functions and performing calculations rather than relying solely on options.

Common Misconceptions

- Confusing the added value: One might mistakenly think G(x) = F(x) + 9 means shifting the y-intercept from 5 to 9, which is incorrect because the shift affects the entire function, not just the y-intercept.
- Misreading the question: Assuming the answer is (0, 9) because that value appears in the options, without verifying through calculations.
- Ignoring the algebraic simplification: Recognizing that G(x) simplifies to -3x + 14 helps avoid errors.

Features and Pros/Cons of the Approach

Features:
- Clear understanding of function transformations.
- Straightforward calculation of y-intercepts using substitution.
- Ability to relate algebraic forms to graphical features.

Pros:
- Simplifies complex transformations into basic algebra.
- Reinforces the concept of function shifts and their impacts on graph features.
- Enhances problem-solving skills through algebraic verification.

Cons:
- Potential for confusion if the initial options are not carefully analyzed.
- Oversight of the significance of the constant term in the function's form.
- Might lead to misinterpretations if the function transformations are not thoroughly understood.

Conclusion and Final Insights

In conclusion, the y-intercept of G(x) = F(x) + 9, given F(x) = -3x + 5, is at (0, 14). This result emphasizes the importance of understanding how simple operations like addition to a function's output affect its graph. When analyzing functions, it's crucial to perform step-by-step calculations rather than relying solely on the options provided.

This problem underscores the significance of algebraic manipulation in understanding the properties of functions. By recognizing that G(x) = -3x + 14, students can directly identify the y-intercept as (0, 14). This approach can be extended to more complex transformations, fostering a deeper grasp of algebraic and graphical relationships in mathematics.

Final note: Always verify your answers through substitution or algebraic simplification to avoid errors and ensure accuracy in your understanding of function properties.

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