2. Find G(f(-4)) When F(x)= 4x+5 And G(x) = 4x^2 -5x - 3 A. 9 B.8 C.329 D. 536D.536

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Understanding how to evaluate composite functions like G(f(-4)) is a fundamental skill in algebra that helps students develop a deeper comprehension of function operations. In this article, we will explore step-by-step how to find G(f(-4)) given the functions F(x) = 4x + 5 and G(x) = 4x^2 - 5x - 3. We will also analyze the significance of these functions, examine methods to evaluate such compositions, and discuss similar problems to enhance your understanding. Additionally, we will provide insights into common mistakes to avoid and tips for mastering composite functions in algebra.

Introduction to Functions and Composition

What Are Functions?

A function is a rule or relationship that assigns exactly one output to each input from a specific set of inputs called the domain. The notation F(x) or G(x) indicates a function named F or G evaluated at a point x.

Key points about functions:

- Each input has one output.
- Functions can be represented algebraically, graphically, or verbally.
- Examples include linear functions, quadratic functions, exponential functions, etc.

Understanding Function Composition

Function composition involves applying one function to the result of another function. The notation (G ∘ F)(x) means G(F(x)) — we first evaluate F at x, then evaluate G at that result.

Example:

Given functions F(x) and G(x):

- $F(x) = 4x + 5$
- $G(x) = 4x^2 - 5x - 3$

Find G(f(-4)) involves two steps: first evaluate F(-4), then input that result into G.

Step-by-Step Solution to Find G(f(-4))

Step 1: Evaluate F(-4)

Given $F(x) = 4x + 5$.

Substitute $x = -4$:

$F(-4) = 4 (-4) + 5 = -16 + 5 = -11$

Result: $F(-4) = -11$

Step 2: Use the result to evaluate G(-11)

Given $G(x) = 4x^2 - 5x - 3$.

Substitute $x = -11$:

$G(-11) = 4 (-11)^2 - 5 (-11) - 3$

Calculate each term:

- $(-11)^2 = 121$
- $4\ 121 = 484$
- $-5 (-11) = 55$

Now, sum all parts:

$G(-11) = 484 + 55 - 3 = 536$

Result: $G(f(-4)) = 536$

Interpreting the Result and Multiple Choice Options

The computed value for G(f(-4)) is 536, which aligns with option D in the multiple-choice question provided:

- A. 9
- B. 8
- C. 329
- D. 536

Thus, the correct answer is option D: 536.

Understanding the Significance of the Functions

Exploring F(x) = 4x + 5

This is a linear function with a slope of 4 and a y-intercept at 5. Its graph is a straight line, and it models relationships with constant rates of change.

Features:

- Linearity ensures predictable behavior.
- For each increase of 1 in x, F(x) increases by 4.

Exploring G(x) = 4x^2 - 5x - 3

This quadratic function models parabolic behavior, with a leading coefficient of 4 indicating the parabola opens upward.

Features:

- The quadratic term dominates the shape.
- The function's minimum or maximum can be found via vertex calculation.
- It models situations involving areas, projectile paths, etc.

Key Concepts in Evaluating Composite Functions

Evaluating composite functions like G(f(x)) involves:

1. Substituting the inner function's value into the outer function.
2. Simplifying step-by-step to ensure accuracy.
3. Paying attention to the order of operations, especially exponents and negative signs.

Common Mistakes to Avoid

- Forgetting to evaluate the inner function before substituting into the outer function.
- Miscalculating exponents, especially negatives and squares.
- Confusing the order of operations: exponentiation before multiplication/addition.
- Overlooking the negative signs during substitution.

Additional Practice Problems

To reinforce understanding, here are some similar problems:

1. Given $F(x) = 3x + 2$ and $G(x) = x^2 - 4x + 1$, find $G(F(2))$.

2. For functions $F(x) = 2x - 1$ and $G(x) = 5x + 7$, evaluate $G(F(-3))$.

3. If $F(x) = x^3 - 3x$ and $G(x) = 2x + 4$, compute $G(f(1))$.

Solutions:

1. $F(2) = 32 + 2 = 8$; then $G(8) = 8^2 - 48 + 1 = 64 - 32 + 1 = 33$.
2. $F(-3) = 2(-3) - 1 = -6 - 1 = -7$; $G(-7) = 5(-7) + 7 = -35 + 7 = -28$.
3. $F(1) = 1^3 - 31 = 1 - 3 = -2$; $G(-2) = 2(-2) + 4 = -4 + 4 = 0$.

Conclusion: Mastering Function Composition in Algebra

Understanding how to evaluate composite functions like $G(f(x))$ is essential for progressing in algebra and higher mathematics. By carefully following the steps—evaluating the inner function first, then substituting into the outer function—you can confidently solve complex problems. Remember to double-check your calculations, especially when dealing with exponents and negative numbers, to avoid common mistakes. Practicing similar problems enhances your skills and prepares you for more advanced topics in mathematics, such as calculus, where function composition plays a vital role.

Summary of Key Points

- Functions assign unique outputs to inputs; understanding their behavior is foundational.
- Function composition involves applying one function to the result of another.
- Careful substitution and step-by-step calculation are crucial for accuracy.
- Mastery of these concepts aids in solving complex algebraic problems and prepares you for advanced math.

By following the detailed approach outlined in this article, learners can confidently tackle similar problems, understand the underlying concepts, and improve their algebraic skills effectively.

Frequently Asked Questions

What is the value of f(-4) when F(x) = 4x + 5?

F(-4) = 4(-4) + 5 = -16 + 5 = -11.

How do you find G(f(-4)) given the functions F and G?

First, find f(-4) using F(x), then substitute that result into G(x).

What is the value of f(-4) for the function F(x) = 4x + 5?

f(-4) = -11.

What is G(-11) when G(x) = 4x^2 - 5x - 3?

G(-11) = 4(-11)^2 - 5(-11) - 3 = 4(121) + 55 - 3 = 484 + 55 - 3 = 536.

What is the final value of G(f(-4)) for the given functions?

G(f(-4)) = 536.

Which answer choice corresponds to G(f(-4))?

D. 536.

Is 536 the correct value of G(f(-4)) based on the calculations?

Yes, G(f(-4)) equals 536.

Why is the answer D. 536 correct for G(f(-4))?

Because f(-4) = -11, and G(-11) = 536, matching choice D.

What steps are involved in solving G(f(-4)) with the given functions?

Calculate f(-4), then substitute that value into G(x) to find G(f(-4)).

Additional Resources

Understanding the Composition of Functions: A Deep Dive into G(f(-4)) with Given Functions F(x) and G(x)

When approaching problems involving the composition of functions, such as G(f(-4)), it's essential to understand the fundamental concepts of functions, their notation, and how to evaluate compositions step-by-step. This comprehensive review will guide you through the process of calculating G(f(-4)) given the functions F(x) = 4x + 5 and G(x) = $4x^2$ - 5x - 3, as well as exploring the underlying principles involved in such problems.

Introduction to Function Composition

Before diving into the specific problem, it's critical to understand what function composition entails. Function composition involves applying one function to the result of another function. The notation G(f(x)) signifies that you first evaluate f(x), then substitute this result into the function G.

- Function Composition Notation:
G(f(x)) indicates the composition of G with f, meaning G is applied to the output of f(x).

- Order of Operations:
The order is crucial: evaluate f(x) first, then G of that result.
For G(f(-4)), the process is:
1. Find f(-4).
2. Plug the value of f(-4) into G to find G(f(-4)).

Understanding the Given Functions

Given the functions:

- $F(x) = 4x + 5$
- $G(x) = 4x^2 - 5x - 3$

These are linear and quadratic functions, respectively. Each has distinct properties:

$F(x) = 4x + 5$

- Type: Linear function
- Slope: 4
- Y-intercept: 5
- Graph: Straight line with a slope of 4, crossing the y-axis at 5.

$G(x) = 4x^2 - 5x - 3$

- Type: Quadratic function
- Leading coefficient: 4 (positive), so parabola opens upward.
- Vertex: Can be found to understand the shape.
- Y-intercept: When $x=0$, $G(0) = -3$.

Step-by-Step Calculation of G(f(-4))

The problem asks: Find $G(f(-4))$.

Let's break this down into manageable steps:

Step 1: Calculate $f(-4)$

Using the function $F(x)$:

$$f(x) = 4x + 5$$

Substitute $x = -4$:

$$
f(-4) = 4 \times (-4) + 5
$$

Calculate:

\[
4 \times (-4) = -16
\]

Add 5:

\[
-16 + 5 = -11
\]

Result:

\[
f(-4) = -11
\]

Step 2: Calculate G(f(-4)) = G(-11)

Now, substitute the value of f(-4) into G(x):

\[
G(-11) = 4 \times (-11)^2 - 5 \times (-11) - 3
\]

Calculate each term:

- \((-11)^2 = 121\)

- \(4 \times 121 = 484\)

- \(-5 \times (-11) = 55\)

Combine the terms:

\[
484 + 55 - 3
\]

Sum:

\[
484 + 55 = 539
\]

Subtract 3:

\[

539 - 3 = 536
\]

Final Result:

\[
G(f(-4)) = 536
\]

Key Takeaways and Insights

This problem illustrates multiple important concepts:

1. Function Evaluation

- Understanding how to evaluate functions at specific points is fundamental.
- Always substitute carefully, respecting the order of operations.

2. Order of Composition

- The order matters: For G(f(-4)), compute f(-4) first, then G of that result.
- Misreading the notation can lead to incorrect calculations.

3. Handling Different Types of Functions

- Linear functions, like F(x), are straightforward to evaluate.
- Quadratic functions, like G(x), require careful calculation, especially with exponents.

4. Arithmetic Accuracy

- Double-check calculations at each step to avoid errors, especially with squaring and multiplication.

Understanding the Multiple Choice Options

The options provided are:

- A. 9
- B. 8
- C. 329

- D. 536

From our calculations, the correct answer is D. 536.

This confirms the importance of meticulous calculation, as multiple-choice options often test attention to detail.

Extended Exploration: Variations and Related Problems

To deepen your understanding, let's consider some related questions and potential variations:

1. What if the input was different?

Suppose the problem asked for G(f(2)). The steps would be similar:

- Calculate f(2):
\(f(2) = 4 \times 2 + 5 = 8 + 5 = 13\)
- Then G(13):
\(G(13) = 4 \times 13^2 - 5 \times 13 - 3\)
\(13^2 = 169\)
\(4 \times 169 = 676\)
\(- 5 \times 13 = -65\)
Sum: \(676 - 65 - 3 = 608\)

2. Graphical interpretation

Plotting F(x) and G(x) can give visual insight into their behavior:

- F(x): A straight line with slope 4, crossing y=5 at x=0.
- G(x): A parabola opening upward, vertex can be found using the standard formula, providing context on where the function reaches minimum value.

3. Domain and Range considerations

- Both functions are defined for all real numbers.
- G(x), being quadratic, can take on any real value depending on x.
- When composing, the domain of G(f(x)) depends on the range of f(x).

Real-World Applications of Function Composition

Understanding how to evaluate compositions like G(f(x)) isn't just an academic exercise—these concepts are foundational in various fields:

- Physics: Calculating the resultant effect when one quantity depends on another, which itself depends on a third variable.
- Economics: Modeling compounded effects, such as cost functions depending on demand, which in turn depends on price.
- Computer Science: Function composition is core to functional programming paradigms where functions are combined to build complex operations.

Advanced Topics and Further Study

For students interested in extending their understanding, consider exploring:

- Inverse functions: How to find $F^{-1}(x)$ and $G^{-1}(x)$.
- Function transformations: How changes in the form of F(x) or G(x) affect the composition.
- Composite function properties: Associativity, distributivity, and how the composition interacts with other operations.

Conclusion and Final Remarks

In summary:

- We started with the functions $F(x) = 4x + 5$ and $G(x) = 4x^2 - 5x - 3$.
- To find G(f(-4)), we first evaluated $f(-4) = -11$.
- Then, we substituted -11 into G(x) to get $G(-11) = 536$.
- The correct multiple-choice answer is D. 536.

This problem exemplifies the importance of methodical evaluation, understanding function notation, and attention to detail. Mastering these skills is vital for tackling more complex mathematical concepts and real-world problems involving functions.

In essence, the key to solving G(f(-4)) lies in understanding the mechanics of function evaluation and the importance of a structured approach.

2 Find G F 4 When F X 4x 5 And G X 4x 2 5x 3 A 9 B 8 C 329 D 536d 536

2 Find G F 4 When F X 4x 5 And G X 4x 2 5x 3 A 9 B 8 C 329 D 536d 536

Related Articles

- If F(x) = 2x = X + 3x + 10 And G(x) = X + 3x + 2x + 4, Determine When F(x) > G(x).
- Now That You Have X - 8x 16 = 9 16, Apply The Square Root Property To The Equation.
- Solving The Linear System Of Equations Using Elimination. 8x - 6y= -20-8x + 4y = 24

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