Given F(x)=3x22 And G(x)=71/2x2, Find The Following Expressions.(a)(fg)(4)(b)(gf)(2)(c)(ff)(1)(d)(gg)(0)

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Understanding how to evaluate composite functions is fundamental in algebra and calculus. In this article, we will explore the process of finding the values of composite functions such as (fg)(x), (gf)(x), (ff)(x), and (gg)(x) at specific points. Using the given functions $F(x) = 3x^2 2$ and $G(x) = 71/2x^2$, we will methodically compute each expression step by step, ensuring clarity and thorough understanding. Whether you're a student preparing for exams or a math enthusiast looking to strengthen your skills, this comprehensive guide will help demystify the process of evaluating composite functions.

Understanding the Given Functions

Before diving into the calculations, it's crucial to interpret the given functions correctly. The functions provided are:

- F(x) = 3x22
- G(x) = 71/2x2

However, these expressions seem ambiguous at first glance. Let's clarify their likely intended forms based on standard notation and context:

Clarification of F(x)

The expression 3x22 probably means $3 \times x \times 2 \times 2$, which simplifies to:

- $F(x) = 3 \times x \times 2 \times 2 = 3 \times x \times 4 = 12x$

Alternatively, it might have been intended as $3x^2 2$, meaning $3 \times x^2 \times 2$, which simplifies to:

- $F(x) = 3 \times x^2 \times 2 = 6x^2$

Given the context and the common pattern of functions, it's more plausible that $F(x) = 12x$ or $F(x) = 6x^2$. To ensure accuracy, let's analyze both possibilities and see which fits better with G(x) and the problem statements.

Clarification of G(x)

Similarly, 71/2x2 likely reads as (71/2) × x × 2 or (71/2) × x^2. Let's examine both:

- Option 1: G(x) = (71/2) × x × 2 = 71 × x
- Option 2: G(x) = (71/2) × x^2

Given the structure, the first seems more straightforward, resulting in G(x) = 71x.

Final assumption for functions:

Based on the above, the most consistent and mathematically reasonable interpretation is:

- F(x) = 12x
- G(x) = 71x

This interpretation aligns with typical function forms and makes subsequent calculations straightforward.

Revised Functions for Calculations

- F(x) = 12x
- G(x) = 71x

With these functions, we can now proceed to compute the required composite functions.

Calculating Composite Functions

The problem requires evaluating the following:

- (a) (fg)(4)
- (b) (gf)(2)
- (c) (ff)(1)
- (d) (gg)(0)

Let's understand what each notation means:

- (fg)(x): Apply G to x, then apply F to the result.
- (gf)(x): Apply F to x, then apply G to the result.
- (ff)(x): Apply F twice, starting from x.
- (gg)(x): Apply G twice, starting from x.

Step-by-step calculations:

(a) Find (fg)(4)

Step 1: Compute G(4)

$$
G(4) = 71 \times 4 = 284
$$

Step 2: Compute F(G(4)) = F(284)

$$
F(284) = 12 \times 284 = 3408
$$

Answer:

$$
(fg)(4) = 3408
$$

(b) Find (gf)(2)

Step 1: Compute F(2)

$$
F(2) = 12 \times 2 = 24
$$

Step 2: Compute G(F(2)) = G(24)

$$
G(24) = 71 \times 24 = 1704
$$

Answer:

$$
(gf)(2) = 1704
$$

(c) Find (ff)(1)

Step 1: Compute F(1)

\[
F(1) = 12 \times 1 = 12
\]

Step 2: Compute F(F(1)) = F(12)

\[
F(12) = 12 \times 12 = 144
\]

Answer:

\[
(ff)(1) = 144
\]

(d) Find (gg)(0)

Step 1: Compute G(0)

\[
G(0) = 71 \times 0 = 0
\]

Step 2: Compute G(G(0)) = G(0)

\[
G(0) = 0
\]

Answer:

\[
(gg)(0) = 0
\]

Summary of Results

Expression	Calculation	Result
$(fg)(4)$	$F(G(4)) = 12 \times 284$	3408
$(gf)(2)$	$G(F(2)) = 71 \times 24$	1704
$(ff)(1)$	$F(F(1)) = 12 \times 12$	144
$(gg)(0)$	$G(G(0)) = 71 \times 0$	0

Conclusion and Key Takeaways

Evaluating composite functions involves carefully following the order of operations: first applying the inner function, then the outer function. The key steps include:

- Substituting the input value into the inner function.
- Calculating the result.
- Using the result as the new input for the outer function.
- Performing the outer function's calculation to obtain the final value.

In our problem, understanding the functions' forms was essential. Assuming $F(x) = 12x$ and $G(x) = 71x$ provided a straightforward path to the solutions. Always verify the function expressions carefully, especially when they are ambiguous or poorly formatted.

Additional Tips for Evaluating Composite Functions

- Break down the problem: Start from the innermost function.
- Substitute accurately: Replace variables with the given input values.
- Follow the order: Remember that $(fg)(x)$ means $F(G(x))$, not $G(F(x))$, and vice versa.
- Check your calculations: Simple arithmetic errors can lead to incorrect results—double-check each step.

Further Practice

To master composite functions, practice with various functions and different points. Try evaluating:

- Different combinations like $(fg)(x)$, $(gf)(x)$, $(ff)(x)$, and $(gg)(x)$ with other functions.
- More complex functions involving quadratic or exponential expressions.
- Inverse functions and their compositions.

Understanding these concepts not only prepares you for exams but also builds a strong foundation for calculus topics such as derivatives and integrals.

Final Remarks

The process of evaluating composite functions is a fundamental skill in mathematics. By carefully interpreting the functions, substituting values, and following the correct order of operations, you can solve these problems efficiently. Remember, clarity in function notation and systematic calculations are your best tools for success.

If you keep practicing, you'll find that working with composite functions becomes intuitive, enabling you to tackle more advanced math topics with confidence.

Frequently Asked Questions

Given F(x) = 3x^2 and G(x) = (7/2)x^2, how do you find (fg)(4)?

First, find F(4) = 3 4^2 = 3 16 = 48. Then, G(4) = (7/2) 4^2 = (7/2) 16 = 7 8 = 56. Therefore, (fg)(4) = F(G(4)) = F(56) = 3 56^2 = 3 3136 = 9408.

How do you compute (gf)(2) given F(x) = 3x^2 and G(x) = (7/2)x^2?

Calculate G(2) = (7/2) 2^2 = (7/2) 4 = 7 2 = 14. Then, F(14) = 3 14^2 = 3 196 = 588. So, (gf)(2) = G(F(2)) = G(3 2^2) = G(12) = (7/2) 12^2 = (7/2) 144 = 7 72 = 504.

What is the value of (ff)(1) if F(x) = 3x^2?

First, find F(1) = 3 1^2 = 3. Then, (ff)(1) = F(F(1)) = F(3) = 3 3^2 = 3 9 = 27.

Calculate (gg)(0) given G(x) = (7/2) x^2.

G(0) = (7/2) 0^2 = 0. Thus, (gg)(0) = G(G(0)) = G(0) = 0.

How do you evaluate (fg)(4) step-by-step?

Calculate G(4) = (7/2) 4^2 = (7/2) 16 = 56. Then, F(56) = 3 56^2 = 3 3136 = 9408. So, (fg)(4) = 9408.

What is the result of (gf)(2) with the given functions?

Calculate F(2) = 3 2^2 = 12. Then, G(12) = (7/2) 12^2 = (7/2) 144 = 7 72 = 504. So, (gf)(2) = 504.

Find the value of (ff)(1) for F(x) = 3x^2.

F(1) = 3 1^2 = 3. Then, (ff)(1) = F(3) = 3 3^2 = 27.

Additional Resources

Given F(x)=3x22 And G(x)=71/2x2, Find The Following Expressions.(a)(fg)(4)(b)(gf)(2)(c)(ff)(1)(d)(gg)(0)

Introduction

Mathematics often presents us with intricate functions that require careful analysis and manipulation to understand their behavior and relationships. In algebra, composition of functions—applying one function to the result of another—is a fundamental concept that underpins many advanced topics, from calculus to computer science. This article delves into a specific set of function compositions involving two given functions:

- \(F(x) = 3x22 \)
- \(G(x) = \frac{71}{2} x 2 \)

Our goal is to evaluate the following expressions:

- (a) \((f g)(4) \)
- (b) \((g f)(2) \)
- (c) \((f f)(1) \)
- (d) \((g g)(0) \)

At first glance, the notation might seem straightforward, but the precise definitions of \(F(x) \) and \(G(x) \) warrant careful interpretation due to their unusual formats. This article will clarify the definitions, interpret the functions correctly, and then methodically compute each composition, providing a comprehensive understanding of the process.

Clarifying the Functions: Understanding \(F(x) \) and \(G(x) \)

The key to solving the problem lies in accurately deciphering the given functions. The original expressions are:

- \(F(x) = 3x22 \)
- \(G(x) = 71/2x2 \)

At first glance, these appear to be written in a shorthand or perhaps contain typographical ambiguities. To proceed, we must interpret these expressions carefully.

Interpreting \(F(x) = 3x22 \)

Possible interpretations include:

1. Concatenation of digits: "3", "x", "22"
2. Mathematical expression: $3 \times x \times 22$

Given the context and typical function notation, the most reasonable assumption is that the intended function is:

$$F(x) = 3 \times x \times 22$$

which simplifies to:

$$F(x) = 66x$$

This interpretation aligns with standard algebraic functions, where the function multiplies the input x by 66.

Interpreting $G(x) = 71/2x2$

Similarly, the expression $71/2x2$ can be interpreted as:

- The fraction $\frac{71}{2}$ multiplied by x, then multiplied by 2, i.e.,

$$G(x) = \left(\frac{71}{2} \right) \times x \times 2$$

Calculating this:

$$G(x) = \frac{71}{2} \times x \times 2 = 71 \times x$$

because the 2 in numerator and denominator cancel out.

Summary of interpretations:

- $F(x) = 66x$
- $G(x) = 71x$

These simplified forms are consistent with standard function notation and make the subsequent calculations straightforward.

Evaluating the Function Compositions

Now that we've established the explicit forms of the functions, we can proceed to evaluate each expression systematically.

Part (a): $(f g)(4)$

Understanding $(f g)(x)$

This notation indicates the composition of functions f and g:

$$
(f g)(x) = f(g(x))
$$

In our context:

- $f(x) = F(x) = 66x$
- $g(x) = G(x) = 71x$

Thus:

$$
(f g)(x) = f(g(x)) = F(G(x))
$$

and for $x = 4$:

$$
(f g)(4) = F(G(4))
$$

Step-by-step Calculation:

1. Compute $G(4)$:

$$
G(4) = 71 \times 4 = 284
$$

2. Compute $F(G(4)) = F(284)$:

$$
F(284) = 66 \times 284
$$

3. Calculate 66×284:

$$
66 \times 284 = (60 + 6) \times 284 = 60 \times 284 + 6 \times 284
$$

- $60 \times 284 = 17,040$
- $6 \times 284 = 1,704$

Adding these:

$$
17,040 + 1,704 = 18,744
$$

Answer for (a):

$$
\boxed{(f g)(4) = 18,744}
$$

Part (b): $(g f)(2)$

Understanding $(g f)(x)$

This is the composition:

$$
(g f)(x) = g(f(x))
$$

Using our functions:

$$
g(f(x)) = G(F(x))
$$

and for $x = 2$:

$$
(g f)(2) = G(F(2))
$$

Step-by-step Calculation:

1. Compute $F(2)$:

$$
F(2) = 66 \times 2 = 132
$$

2. Compute $G(F(2)) = G(132)$:

$$
G(132) = 71 \times 132
$$

3. Calculate 71×132:

- Break down:

$$
71 \times 132 = 71 \times (100 + 30 + 2) = 71 \times 100 + 71 \times 30 + 71 \times 2
$$

- Calculate each:

- $71 \times 100 = 7,100$
- $71 \times 30 = 2,130$
- $71 \times 2 = 142$

- Sum:

$$
7,100 + 2,130 + 142 = 9,372
$$

Answer for (b):

$$
\boxed{(g f)(2) = 9,372}
$$

Part (c): $(f f)(1)$

Understanding $(f f)(x)$

This is the composition:

$$
(f f)(x) = f(f(x))
$$

which involves applying F twice:

$$
f(f(1))
$$

Step-by-step Calculation:

1. Compute $F(1)$:

$$
F(1) = 66 \times 1 = 66
$$

2. Compute $F(F(1)) = F(66)$:

$$
F(66) = 66 \times 66
$$

3. Calculate 66×66:

- 66×66 can be computed as:

$$
(60 + 6) \times (60 + 6) = 60 \times 60 + 2 \times 60 \times 6 + 6 \times 6
$$

- Calculations:

- $60 \times 60 = 3,600$
- $2 \times 60 \times 6 = 2 \times 360 = 720$
- $6 \times 6 = 36$

- Summing:

$$
3,600 + 720 + 36 = 4,356
$$

Answer for (c):

$$
\boxed{(f f)(1) = 4,356}
$$

Part (d): $(g g)(0)$

Understanding $(g g)(x)$

This is the composition:

$$
(g g)(x) = g(g(x))
$$

which involves applying G twice:

$$
g(g(0))
$$

Step-by-step Calculation:

1. Compute $G(0)$:

$$
G(0) = 71 \times 0 = 0
$$

2. Compute $G(G(0)) = G(0)$:

\[
G(0) = 0
\]

Since \(G(0) = 0 \), applying \(G \) again yields:

\[
G(0) = 0
\]

Answer for (d):

\[
\boxed{(g g)(0) = 0}
\]

Summary of Results

Expression	Result
(a) \((f g)(4) \)	18,744
(b) \((g f)(2) \)	9,372
(c) \((f f)(1) \)	4,356
(d) \((g g)(0) \)	0

Final Remarks

This exploration highlights the importance of correctly interpreting function notation and expressions, especially when the initial data appears ambiguous. By assuming the most logical algebraic forms—multip

Given F X 3x22 And G X 71 2x2 Find The Following Expressions A Fg 4 B Gf 2 C Ff 1 D Gg 0

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