Please Help!!f(x) = 3x + 9, G(x) = 5x^2 Find (f + G) (x)

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Understanding how to combine functions is a fundamental concept in algebra and calculus, especially when working with composite functions or performing function operations such as addition, subtraction, multiplication, or division. In this comprehensive guide, we will explore how to find the sum of two functions, specifically focusing on the functions f(x) = 3x + 9 and G(x) = 5x^2. We will break down the process step-by-step, clarify essential concepts, and provide practical examples to enhance your understanding. Whether you're a student studying algebra or someone brushing up on mathematical skills, this article aims to make the process clear and accessible.

Understanding Functions and Function Notation

Before diving into the calculation, it’s crucial to understand what functions are and how they work.

What Is a Function?

A function is a relation between a set of inputs and a set of permissible outputs with the property that each input (usually represented as x) has exactly one output (f(x)).

For example:
- f(x) = 3x + 9
- G(x) = 5x^2

Here, each function maps each real number x to its corresponding output based on the formula.

Function Notation

Function notation is a way to denote functions clearly. For example:
- f(x) indicates the output of function f when the input is x.
- G(x) indicates the output of function G when the input is x.

When combining functions, such as adding them, it’s essential to understand how their formulas combine based on their input variable.

Step-by-Step Guide to Find (f + G)(x)

The main goal is to find the sum of the functions f(x) and G(x), which is denoted as (f + G)(x). This means:

$$
(f + G)(x) = f(x) + G(x)
$$

Let's break this down:

Step 1: Write down the given functions

- $f(x) = 3x + 9$
- $G(x) = 5x^2$

Step 2: Set up the sum of the functions

$$
(f + G)(x) = (3x + 9) + (5x^2)
$$

Step 3: Combine like terms

Since the functions are in terms of x, and their terms are different (linear vs. quadratic), we simply write the sum as:

$$
(f + G)(x) = 3x + 9 + 5x^2
$$

Rearranged in standard polynomial form:

$$
(f + G)(x) = 5x^2 + 3x + 9
$$

Step 4: Verify the result

It’s always good to double-check your work by substituting a value of x into the original functions and the combined function to see if the addition holds.

Example:
Let $x = 2$,

- $f(2) = 3(2) + 9 = 6 + 9 = 15$
- $G(2) = 5(2)^2 = 5(4) = 20$
- Sum: $15 + 20 = 35$

Now, evaluate $(f + G)(2)$:

$$
5(2)^2 + 3(2) + 9 = 5(4) + 6 + 9 = 20 + 6 + 9 = 35
$$

The result matches, confirming our formula.

Detailed Explanation of the Components

Understanding each component helps solidify the concept.

Adding Functions: The Concept

Adding functions involves combining their formulas by adding their outputs for the same input x. This is straightforward because it respects the rules of algebra.

Why Combine Like Terms?

In polynomial expressions, like terms (terms with the same degree) are combined to simplify the expression.

In our case:
- $5x^2$ is a quadratic term.
- $3x$ is a linear term.
- 9 is a constant.

Since these are different degrees, they cannot be combined further.

Implication of the Result

The resulting function $(f + G)(x) = 5x^2 + 3x + 9$ represents a quadratic function shifted or scaled based on the original functions.

Further Examples and Practice Problems

Practicing with different functions helps improve understanding. Here are some examples:

Example 1:

Find $(f + G)(x)$ where:
- $f(x) = 2x - 4$
- $G(x) = x^2 + 3$

Solution:
$$
(f + G)(x) = (2x - 4) + (x^2 + 3) = x^2 + 2x - 1
$$

Example 2:

Suppose $f(x) = x^3 + 2x$ and $G(x) = -x^3 + 4$. Find $(f + G)(x)$.

Solution:
$$
(f + G)(x) = (x^3 + 2x) + (-x^3 + 4) = (x^3 - x^3) + 2x + 4 = 2x + 4
$$

Practice Problems:

- Find $(f + G)(x)$ for $f(x) = 4x - 7$ and $G(x) = 3x^2 + 2$.
- Given $f(x) = x/2 + 5$ and $G(x) = -x^2 + 3x$, find $(f + G)(x)$.

Applications of Function Addition in Real Life

Understanding how to add functions is not only an academic exercise but also has practical applications in various fields.

In Physics

- Calculating combined forces acting on an object involves adding functions representing different force components.

In Economics

- Total revenue or cost functions are often sums of individual profit or expense functions.

In Engineering

- Signal processing involves adding functions representing different signals to understand the combined effect.

In Data Science

- Combining models or functions to get a comprehensive view of data behavior.

Common Mistakes to Avoid

While adding functions seems straightforward, beginners often make simple errors. Here are some common mistakes to watch out for:

1. Forgetting to Combine Like Terms

Remember: only terms with the same degree (x^2, x, constant) should be combined.

2. Mixing Variables

Ensure that the variable x is consistent across functions. Do not substitute or change variables unless specified.

3. Misreading the Functions

Double-check the functions' formulas before performing addition to avoid errors.

4. Overlooking the Domain

Be aware of the domain restrictions if any are specified, especially when dealing with square roots or denominators.

Conclusion: Mastering Function Addition

Adding functions such as $f(x) = 3x + 9$ and $G(x) = 5x^2$ is a fundamental skill that serves as a building block for more advanced mathematical concepts. The key steps involve expressing each function clearly, adding their formulas term by term, and simplifying the result. Practice with various types of functions to develop confidence and proficiency.

Remember:
- Always write down the original functions.
- Combine like terms carefully.
- Verify your results with substitution.
- Understand the real-world applications of these operations to appreciate their importance.

By mastering these concepts, you will be well-equipped to handle more complex function operations and solve diverse mathematical problems with confidence and precision.

Keywords: functions, addition of functions, f(x), G(x), how to find (f + G)(x), algebra, polynomial functions, combining functions, function operations, mathematical skills, practice problems

Frequently Asked Questions

What is the formula for $(f + G)(x)$ when $f(x) = 3x + 9$ and $G(x) = 5x^2$?

To find $(f + G)(x)$, add the functions: $(f + G)(x) = f(x) + G(x) = (3x + 9) + (5x^2) = 5x^2 + 3x + 9$.

How do I simplify $(f + G)(x)$ with the given functions?

Simply combine like terms: $5x^2 + 3x + 9$. Since there are no like terms to combine further, this is the simplified form.

What is the degree of the resulting function (f + G)(x)?

The degree is 2, because the highest power of x in $5x^2 + 3x + 9$ is 2.

Can I evaluate (f + G)(x) for a specific value of x, say x=2?

Yes. Substitute x=2: $(f + G)(2) = 5(2)^2 + 3(2) + 9 = 5(4) + 6 + 9 = 20 + 6 + 9 = 35$.

If f(x) and G(x) are combined, what is the leading coefficient of (f + G)(x)?

The leading coefficient is 5, coming from the $5x^2$ term in G(x), which dominates the degree of the combined function.

How does finding (f + G)(x) help in understanding the combined behavior of these functions?

Adding the functions shows how their outputs combine for each input x, helping analyze combined growth rates and overall behavior of the sum function.

Additional Resources

Please Help!! $f(x) = 3x + 9$, $G(x) = 5x^2$ Find (f + G)(x) – this is a common type of problem encountered in algebra, especially when working with functions and their combinations. Whether you're a student preparing for exams or someone brushing up on foundational concepts, understanding how to compute the sum of two functions is essential. In this guide, we’ll walk through the process step-by-step, explore related concepts, and provide helpful tips to master this type of problem confidently.

Understanding the Problem

When asked to find (f + G)(x), you're essentially asked to compute the sum of two functions, f(x) and G(x), evaluated at a specific value of x. The notation (f + G)(x) represents a new function defined as:

$$
(f + G)(x) = f(x) + G(x)
$$

Given:

- $f(x) = 3x + 9$
- $G(x) = 5x^2$

Your task is to determine $(f + G)(x)$, which involves combining these two functions into a single expression.

Step-by-Step Breakdown of How to Find $(f + G)(x)$

Step 1: Understand Each Function Individually

- $f(x) = 3x + 9$

This is a linear function, with slope 3 and y-intercept 9. It increases linearly as x increases.

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

This is a quadratic function, opening upwards with a coefficient of 5, which determines its "width" and steepness.

Step 2: Recall the Definition of Function Addition

The sum of two functions, f + G, is found by adding their expressions:

$$
(f + G)(x) = f(x) + G(x)
$$

This means for any input x, the output is just the sum of the outputs of f and G at that x.

Step 3: Write the Expression for $(f + G)(x)$

Substitute the given functions into the formula:

$$
(f + G)(x) = (3x + 9) + (5x^2)
$$

Step 4: Simplify the Expression

Combine like terms and write the sum in standard polynomial form:

$$
(f + G)(x) = 5x^2 + 3x + 9
$$

This is the new combined function. It is a quadratic polynomial that represents the sum of the original functions.

Visualizing the Result

Graphical Interpretation

- The graph of $f(x) = 3x + 9$ is a straight line.
- The graph of $G(x) = 5x^2$ is a parabola opening upwards.
- The graph of $(f + G)(x) = 5x^2 + 3x + 9$ combines these features, resulting in a parabola that is shifted and shaped according to the coefficients.

Why is this important?

Understanding how the sum of functions affects their graphs helps in many applications, from physics (combining forces) to economics (adding profit functions). The algebraic approach provides a precise way to analyze and predict behavior.

Practical Applications and Related Concepts

1. Function Composition vs. Addition

- Addition: Combining two functions as shown.
- Composition: Applying one function to the result of another, denoted as $f \circ G(x) = f(G(x))$.

Understanding the difference is key in advanced math.

2. Evaluating $(f + G)(x)$ at Specific Values

You might be asked to evaluate $(f + G)(x)$ at specific x values:

- For example, at $x = 2$:

$$
(f + G)(2) = 5(2)^2 + 3(2) + 9 = 5(4) + 6 + 9 = 20 + 6 + 9 = 35
$$

3. Extending to Other Operations

- Difference: $(f - G)(x) = f(x) - G(x)$
- Product: $(f \times G)(x) = f(x) \times G(x)$
- Quotient: $(f / G)(x) = \frac{f(x)}{G(x)}$, provided $G(x) \neq 0$

Mastering these helps in solving complex problems.

Tips for Solving Function Addition Problems

- Always write out each function explicitly before combining.
- Combine like terms carefully, especially when dealing with polynomials.
- Check your work by substituting specific values to ensure the combined function behaves as expected.
- Practice with different types of functions to build confidence.

Summary

To find (f + G)(x) when given f(x) = 3x + 9 and G(x) = 5x^2, follow these straightforward steps:

1. Write out both functions.
2. Add their expressions directly: \(\text{sum} = f(x) + G(x)\).
3. Simplify the resulting expression, combining like terms.
4. The final answer: (f + G)(x) = 5x^2 + 3x + 9.

This exercise illustrates the fundamental skill of combining functions algebraically, a vital concept for more advanced topics like calculus, differential equations, and mathematical modeling.

Final Thoughts

Mastering the process of adding functions not only helps in solving algebraic problems but also deepens your understanding of how functions behave individually and collectively. Whether you’re calculating the combined output of multiple systems or exploring the properties of polynomial functions, this foundational skill opens doors to more complex mathematical adventures.

If you ever feel stuck, remember to write out each function clearly, substitute values to verify your work, and practice regularly. With time, these steps will become second nature, empowering you to tackle any similar problems with confidence.

Happy studying!

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