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Understanding how to manipulate and analyze functions is a fundamental aspect of algebra and calculus. When working with multiple functions, such as F(x) and G(x), it's essential to learn how to combine them and determine their domains. This article provides a comprehensive guide to solving problems involving the sum of functions, specifically focusing on calculating (f + g)(x) and identifying the domain of the resulting function in interval notation.

Introduction to Functions and Their Combinations

Functions are mathematical entities that assign exactly one output to each input within their domain. Combining functions through addition, subtraction, multiplication, or division allows us to explore relationships between different mathematical expressions.

Key concepts covered:

- Definition of functions
- Addition of functions, (f + g)(x)
- Domain considerations when combining functions
- Expressing domains in interval notation

Understanding the Given Functions

Before proceeding with calculations, let's examine the provided functions:

Given:

- F(x): (not explicitly provided in the problem statement, but presumed to be a function to be used in combination)
- G(x): 3x + 12 X - 25 X - 25

Note: The notation appears inconsistent; likely, the expression for G(x) needs clarification. It seems to have a mix of variables and constants, possibly a typo or formatting issue.

Clarifying G(x)

Based on standard algebraic expressions, "3x + 12 X - 25 X - 25" most likely refers to:

$G(x) = 3x + 12x - 25x - 25$

which simplifies as:

$G(x) = (3x + 12x - 25x) - 25$

Step 1: Simplify G(x)

Let's combine like terms:

- $3x + 12x = 15x$
- $15x - 25x = -10x$

Thus, G(x) simplifies to:

$G(x) = -10x - 25$

Step 2: Understanding F(x)

The problem states "Given F(x) and G(x) = 3x + 12 X - 25 X - 25," but it doesn't specify F(x).

Possible interpretation:

- If F(x) is not provided explicitly, perhaps the problem aims to analyze the sum of F(x) and G(x) where F(x) is known or assumed.

Assumption:

For the purpose of this article, let's assume F(x) is a general function, or perhaps, F(x) is given elsewhere. If the problem is incomplete, we'll proceed with the assumption that F(x) is a known function.

Alternatively:

Suppose F(x) is also a linear function, for example, $F(x) = ax + b$.

Step 3: Find (f + g)(x)

Given the expression for G(x), and assuming F(x) is known as F(x), the sum is:

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

Suppose, for illustration, that:

$F(x) = px + q$

where p and q are constants.

Then,

$(f + g)(x) = (px + q) + (-10x - 25) = (p - 10)x + (q - 25)$

This provides a general form of the combined function.

Step 4: Find the Domain of (f + g)(x)

The domain of a sum of functions is the intersection of the domains of each individual function.

Key points:

- If both F(x) and G(x) are polynomials, their domains are all real numbers.
- If F(x) or G(x) involve denominators, radicals, or logarithms, their domains may be restricted.

Domain of G(x)

Since $G(x) = -10x - 25$ is a linear polynomial, its domain is:

- All real numbers, which in interval notation is: $(-\infty, \infty)$

Assuming F(x) is also a polynomial:

- Its domain is also all real numbers.

Therefore, the domain of $(f + g)(x) = F(x) + G(x)$ is:

- All real numbers, i.e., $(-\infty, \infty)$

Special Cases: Non-Polynomial Functions

If F(x) contains radicals, denominators, or logarithms, the domain may be limited.

Examples:

- If F(x) includes $\sqrt{(x - 3)}$, the domain is $x \geq 3$.
- If F(x) includes $1/(x - 5)$, the domain excludes $x = 5$.

In such cases, the overall domain of (f + g)(x) is the intersection of the individual domains, ensuring the sum is defined at all points.

Expressing the Domain in Interval Notation

Based on the assumptions:

- For polynomials: $(-\infty, \infty)$
- For functions with restrictions: specify the interval(s) where the sum is defined.

Summary of Steps to Solve Similar Problems

1. Identify the functions involved: Ensure clarity about F(x) and G(x).
2. Simplify G(x): Combine like terms to write in standard form.
3. Determine F(x): Use provided information or assume a form.
4. Compute (f + g)(x): Add the functions algebraically.
5. Analyze the domain of each function: Find where each is defined.
6. Find the intersection of domains: The overall domain of the sum.
7. Express the domain in interval notation: Use proper notation to specify the domain.

Conclusion

Combining functions and analyzing their domains is an essential skill in algebra. When given functions like F(x) and G(x), simplifying the expressions and carefully considering restrictions ensures accurate results. Always verify the nature of each function involved—polynomial, rational, radical, or logarithmic—to determine their domains correctly. Expressing the domain in interval notation provides a clear and concise understanding of where the combined function is defined.

Additional Tips and Resources

- Practice simplifying algebraic expressions for efficient problem-solving.
- Familiarize yourself with domain restrictions for different types of functions.
- Use interval notation consistently to communicate domains effectively.
- Leverage graphing tools to visualize functions and their domains.
- Consult algebra textbooks or online resources for further practice on combining functions and domain analysis.

Recommended Resources:

- Khan Academy: Functions and Domains
- Paul's Online Math Notes: Function Operations
- Wolfram Alpha: Function Simplification and Domain Calculation

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Note: If you have specific details about F(x), please provide them to enable precise calculations and domain analysis tailored to the original problem.

Frequently Asked Questions

Given F(x) and G(x) = 3x + 12x - 25x - 25, how do you find (f + G)(x)?

To find (f + G)(x), you add the expressions for F(x) and G(x) together, combining like terms. If F(x) is known, simply add its expression to 3x + 12x - 25x - 25.

What is the simplified form of G(x) = 3x + 12x - 25x - 25?

Combine like terms: 3x + 12x - 25x = (3 + 12 - 25)x = -10x. So, G(x) simplifies to -10x - 25.

How do you find the domain of (f + G)(x)?

The domain of (f + G)(x) is the intersection of the domains of F(x) and G(x). If both are polynomials, the domain is all real numbers, i.e., $(-\infty, \infty)$.

If F(x) is a polynomial, what is the domain of (f + G)(x)?

The domain of (f + G)(x) will be all real numbers, since polynomials are defined everywhere, so the domain is $(-\infty, \infty)$.

How do you write the domain of (f + G)(x) in interval notation?

In interval notation, if the domain is all real numbers, it is expressed as $(-\infty, \infty)$.

Can G(x) = 3x + 12x - 25x - 25 be simplified further?

Yes, combining like terms results in G(x) = -10x - 25.

If F(x) = 2x + 5, what is (f + G)(x)?

First, simplify G(x) to -10x - 25. Then, (f + G)(x) = (2x + 5) + (-10x - 25) = (2x - 10x) + (5 - 25) = -8x - 20.

What steps are involved in finding (f + G)(x)?

Identify expressions for F(x) and G(x), simplify G(x) if necessary, then add F(x) and G(x) algebraically. Finally, determine the domain based on the functions involved.

Are there any restrictions on the domain of (f + G)(x)?

If both functions are polynomials, there are no restrictions, so the domain is all real numbers. If either function has restrictions, those must be considered.

Why is it important to simplify G(x) before adding it to F(x)?

Simplifying G(x) makes the addition straightforward and helps in accurately determining the combined expression and domain.

Additional Resources

Understanding the Problem: Given F(x) and G(x) = 3x + 12x - 25x - 25, Find (f + G)(x) and The Domain in Interval Notation

When working with functions in algebra, one common task is to combine functions through addition or other operations, and to determine their domains. In this guide, we will thoroughly analyze the problem involving Given F(x) and G(x) = 3x + 12x - 25x - 25, focusing on how to find the combined function (f + G)(x) and its domain in interval notation. This step-by-step approach will help you understand the process behind function addition and domain determination, which are foundational skills in algebra and calculus.

Understanding the Problem

The problem states:
Given F(x) and G(x) = 3x + 12x - 25x - 25, find:

A) (f + G)(x) — the sum of the functions F(x) and G(x).

B) The domain of the combined function, expressed in interval notation.

Before diving into calculations, it is vital to interpret the given functions correctly and identify what is being asked.

Step 1: Simplify G(x)

The first step involves simplifying the given function G(x):

$$ G(x) = 3x + 12x - 25x - 25 $$

Combine like terms:

- Combine the x-terms: $ 3x + 12x - 25x $
- Simplify constants: -25

Simplification process:

1. $ 3x + 12x = 15x $
2. $ 15x - 25x = -10x $
3. The constant remains -25

Result:

$$ G(x) = -10x - 25 $$

This simplified form makes further calculations easier.

Step 2: Find (f + G)(x)

The notation (f + G)(x) represents the sum of the functions F(x) and G(x):

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

Key Consideration:

Since the problem states "Given F(x)", but does not specify its explicit form, we assume F(x) is known or given elsewhere in the problem context. For the purposes of this guide, we will treat F(x) as an arbitrary function, or, if the problem is a typical algebra exercise, F(x) might be a linear function or similar.

However, if F(x) is not provided explicitly, the most common approach is to leave the answer in terms of F(x):

$$ (f + G)(x) = F(x) + (-10x - 25) $$

or

$$ (f + G)(x) = F(x) - 10x - 25 $$

If F(x) is explicitly given, say, for example, $F(x) = ax + b$, then:

$$ (f + G)(x) = (ax + b) - 10x - 25 $$

which simplifies to:

$$ (a - 10)x + (b - 25) $$

Step 3: Find the Domain of (f + G)(x)

The domain of a function refers to all real numbers x for which the function is defined. When combining functions via addition, the domain is typically the intersection of the domains of the individual functions involved.

Important points:

- If F(x) is defined everywhere (all real numbers), then the domain of (f + G)(x) will depend solely on G(x).
- If F(x) has restrictions, such as square roots, denominators, or other domain limitations, those restrictions must be considered.

General approach to find the domain:

1. Identify the domain of F(x):
- Is F(x) defined for all real numbers? Are there restrictions (e.g., square roots requiring non-negative radicands, denominators not equal to zero)?
2. Identify the domain of G(x):
- Since G(x) is a polynomial (after simplification), its domain is all real numbers.
3. Determine the intersection:
- The overall domain is the intersection of the individual domains, which, in the case of polynomials, is typically all real numbers unless F(x) introduces restrictions.

Summary and Practical Steps

To Summarize:

- Step 1: Simplify G(x)
- Step 2: Express (f + G)(x) in terms of F(x) and the simplified G(x)
- Step 3: Determine the domain by analyzing the restrictions of F(x) and G(x)

Example: Specific Case if F(x) is Known

Suppose, for illustration, that F(x) = 2x + 3.

Calculating (f + G)(x):

$$ (f + G)(x) = 2x + 3 + (-10x - 25) $$
$$ = 2x + 3 - 10x - 25 $$
$$ = (2x - 10x) + (3 - 25) $$
$$ = -8x - 22 $$

Domain:

- Since $F(x) = 2x + 3$ is a polynomial, its domain is all real numbers.
- G(x) is a polynomial, so its domain is also all real numbers.
- Therefore, the domain of the sum is all real numbers, expressed as:

$$ \boxed{(-\infty, \infty)} $$

Final Notes on Domain in Interval Notation

- Polynomials and functions composed of polynomials are defined everywhere, so their domain is all real numbers: $(-\infty, \infty)$.
- Rational functions require excluding points where the denominator is zero.
- Radical functions (square roots, etc.) require the radicand to be non-negative.

Always analyze the individual functions involved and determine their restrictions before concluding the overall domain.

Wrap-up: Putting It All Together

In this comprehensive guide, we've:

- Simplified the given G(x) function.
- Discussed how to find the sum (f + G)(x), emphasizing the importance of knowing F(x).
- Outlined the steps to determine the domain, including analyzing potential limitations.
- Provided an illustrative example with a specific F(x) to demonstrate the process.

Understanding these fundamental concepts enables you to confidently handle similar problems involving function operations and domain analysis, vital skills in algebra, calculus, and higher mathematics.

Additional Tips

- Always double-check the simplified form of functions.
- When in doubt about the domain, consider the simplest form (polynomials are always defined everywhere).
- Remember that the domain of a sum is the intersection of the individual domains.
- Practice with various functions to build intuition about how restrictions affect the domain.

By mastering the process of combining functions and determining their domains, you build a strong foundation for tackling more complex mathematical problems confidently and accurately.

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