F(x)=x+5 And G(x)=x^((3)/(2)) Find The Formula For (f+g)(x) And Simplify Your Answer. Then Find The Domain

F(x)=x+5 And G(x)=x^((3)/(2)) Find The Formula For (f+g)(x) And Simplify Your Answer. Then Find The Domain

Understanding the combination of functions is a fundamental aspect of algebra and calculus. In this article, we will explore the functions $F(x) = x + 5$ and $G(x) = x^{3/2}$, find the formula for their sum, simplify the expression, and determine the domain of the resulting function. Whether you're a student preparing for exams or someone interested in mathematical functions, this comprehensive guide will clarify these concepts with clear explanations and examples.

1. Introduction to the Functions F(x) and G(x)

Before diving into the combination of the functions, let's understand each function individually.

1.1. The Function $F(x) = x + 5$

- Type of Function: Linear function
- Graph Characteristics: A straight line with a slope of 1 and a y-intercept at 5
- Domain: All real numbers (since you can plug any real number into x)

1.2. The Function $G(x) = x^{3/2}$

- Type of Function: Power function, more specifically, a fractional exponent function
- Expression Explanation:
- The exponent 3/2 can be rewritten as $(x^{1/2})^3$
- $x^{1/2}$ is the square root of x
- Graph Characteristics: Starts at the origin, increasing for $x \geq 0$, with a shape similar to a cubic root function but scaled
- Domain: $x \geq 0$ (since the square root function is only defined for non-negative real numbers in the real number system)

---

2. Finding (f + g)(x): The Sum of the Functions

The sum of two functions, often denoted as $(f + g)(x)$, involves adding the values of the two functions for each x in their common domain.

2.1. The Formula for (f + g)(x)

To find $(f + g)(x)$:

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

Substituting the given functions:

$$ (f + g)(x) = (x + 5) + x^{3/2} $$

This expression combines a linear term with a radical power term.

2.2. Simplification of $(f + g)(x)$

The sum is already in its simplest form:

$$ (f + g)(x) = x + 5 + x^{3/2} $$

Since the terms are of different types (linear and radical power), there's no further algebraic simplification unless factoring or other advanced techniques are involved, which are not applicable here.

---

3. Domain of $(f + g)(x)$

Understanding the domain of the combined function is critical, especially because each individual function has its own domain restrictions.

3.1. Domain of $f(x) = x + 5$

- The domain of $f(x)$ is all real numbers: $\mathbb{R}$

3.2. Domain of $g(x) = x^{3/2}$

- The domain of $g(x)$ is $x \geq 0$ because:
- The square root function $\sqrt{x}$ is only defined for $x \geq 0$
- Raising $\sqrt{x}$ to the third power doesn't restrict the domain further

3.3. Domain of $(f + g)(x)$

- Since $(f + g)(x)$ involves adding $f(x)$ and $g(x)$, the domain is constrained by the more restrictive domain, which is $x \geq 0$.
- Therefore, the domain of $(f + g)(x)$ is:

$$ \boxed{ \text{Domain} = [0, \infty) } $$

This means the combined function is defined for all real x starting from 0 and extending to positive infinity.

---

4. Practical Examples and Applications

Understanding the combined function $(f + g)(x)$ can be useful in various real-world scenarios and mathematical problems.

4.1. Example Calculations

- At $x = 0$:

$$ (f + g)(0) = 0 + 5 + 0^{3/2} = 0 + 5 + 0 = 5 $$

- At $x = 4$:

$$ (f + g)(4) = 4 + 5 + 4^{3/2} $$

Calculate $4^{3/2}$:

$$ 4^{3/2} = (4^{1/2})^3 = (2)^3 = 8 $$

So,

$$ (f + g)(4) = 4 + 5 + 8 = 17 $$

- At $x = 9$:

$$ (f + g)(9) = 9 + 5 + 9^{3/2} $$

Calculate $9^{3/2}$:

$$ 9^{3/2} = (9^{1/2})^3 = (3)^3 = 27 $$

Thus,

$$ (f + g)(9) = 9 + 5 + 27 = 41 $$

4.2. Applications in Physics and Engineering

- The linear part $x + 5$ might represent a linear relationship, such as displacement over time with an initial offset.
- The radical part $x^{3/2}$ could model phenomena involving power-law growth or decay, such as certain types of energy or material deformation.
- Combining these functions allows modeling complex systems where multiple factors influence the outcome simultaneously.

---

5. Visualizing the Functions and Their Sum

Graphical representation helps in understanding the behavior of the functions.

5.1. Graph of $f(x) = x + 5$

- A straight line crossing the y-axis at 5
- Slope of 1, indicating a steady increase

5.2. Graph of $g(x) = x^{3/2}$

- Starts at the origin (0,0)
- Curve rises gradually for $x > 0$
- Steepness increases as x increases

5.3. Graph of $(f + g)(x) = x + 5 + x^{3/2}$

- Combination of linear and radical growth
- For $x \geq 0$, the curve starts at (0,5) and rises, with the shape influenced by both components

Using graphing tools or graphing calculators can provide visual insights into the combined function's behavior across its domain.

---

6. Summary and Key Takeaways

- The sum of the functions $f(x) = x + 5$ and $g(x) = x^{3/2}$ is:

$$(f + g)(x) = x + 5 + x^{3/2}$$

- The domain of $(f + g)(x)$ is $x \geq 0$, because $g(x)$ involves a square root, which is only defined for non-negative x.
- The combined function includes both linear and radical components, which influence its shape and growth rate.
- Understanding these concepts is essential for solving complex algebraic problems and applying functions in various scientific fields.

---

7. Conclusion

Combining functions is a core skill in mathematics that enables the modeling of complex relationships. By carefully analyzing the individual functions, performing addition, simplifying the expression, and determining the domain, we gain a comprehensive understanding of the resulting function's behavior. Remember to always consider the restrictions implied by each component function, especially when dealing with radicals and fractional exponents. With practice, these techniques become intuitive, allowing for effective problem-solving in advanced mathematics and real-world applications.

Frequently Asked Questions

What is the formula for $(f + g)(x)$ given $f(x) = x + 5$ and $g(x) = x^{(3/2)}$?

$(f + g)(x) = (x + 5) + x^{(3/2)}$

How do you simplify the expression for $(f + g)(x)$ when $f(x) = x + 5$ and $g(x) = x^{(3/2)}$?

The simplified form is $(f + g)(x) = x + 5 + x^{(3/2)}$

What is the domain of $(f + g)(x) = x + 5 + x^{(3/2)}$?

The domain is $x \geq 0$ because $x^{(3/2)}$ is only real for $x \geq 0$.

Why is the domain of $g(x) = x^{(3/2)}$ restricted to $x \geq 0$?

Because $x^{(3/2)}$ involves a square root, which is only defined for $x \geq 0$ in the real numbers.

Can you express $(f + g)(x)$ in a factored form?

Not easily, since the sum involves a linear term and a fractional power, so it remains as $x + 5 + x^{(3/2)}$.

Is the function $(f + g)(x)$ continuous on its domain?

Yes, because both components are continuous for $x \geq 0$, so their sum is also continuous there.

How does the domain of $(f + g)(x)$ compare to the individual domains of $f(x)$ and $g(x)$?

Since $f(x) = x + 5$ is defined for all real x, but $g(x) = x^{(3/2)}$ is only for $x \geq 0$, the domain of $(f + g)(x)$ is $x \geq 0$.

What are some real-world applications of combining functions like f and g?

Combining functions like these can model scenarios where a linear process (f) and a nonlinear process (g) interact, such as in physics or economics when analyzing combined effects.

Additional Resources

Mathematics
Unlocking the Power of Function Composition and Domain Analysis: A Deep Dive into F(x) and G(x)

Introduction

Mathematics, often regarded as the language of the universe, offers a fascinating window into the relationships between quantities. Among its core concepts are functions—rules that assign each input a specific output. Today, we'll explore two particular functions: $F(x) = x + 5$ and $G(x) = x^{3/2}$. Our goal is to combine these functions to find $(f + g)(x)$, simplify the expression, and determine its domain.

This exploration isn't just about crunching numbers; it's a journey into understanding how functions interact, how their domains influence their behaviors, and how these concepts apply in real-world contexts like engineering, physics, and data analysis. Think of it as a product review, but for mathematical functions—examining their features, limitations, and optimal use cases.

Understanding the Individual Functions

Before combining the functions, it's crucial to understand each one thoroughly.

$F(x) = x + 5$

- Type: Linear function
- Features:
- Adds 5 to any input x.
- Graphically, it's a straight line with a slope of 1.
- Domain: all real numbers ($\mathbb{R}$)
- Range: all real numbers ($\mathbb{R}$)
- Applications:
- Used to model constant shifts or offsets.
- Example: Adjusting temperature readings, adding a fixed value to measurements.

$G(x) = x^{3/2}$

- Type: Power function with a fractional exponent
- Features:
- The exponent $3/2$ can be interpreted as $\sqrt{x^3}$.
- When expressed as $\sqrt{x^3}$, it emphasizes the domain restrictions.
- Behavior:
- For positive x, $x^{3/2}$ is real and positive.
- For negative x, $x^{3/2}$ is not real because the square root of a negative number is not real (unless considering complex numbers, which is beyond the scope here).
- Domain:
- Since square roots of negative numbers are undefined in real numbers, the domain is $x \geq 0$.
- Range:
- Since $x^{3/2}$ is non-negative for $x \geq 0$, the range is $y \geq 0$.

Part 1: Finding the Formula for $(f + g)(x)$

The sum of two functions, $(f + g)(x)$, is obtained by adding their outputs for each input x:

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

Given the functions:

$$
F(x) = x + 5
$$
$$
G(x) = x^{3/2}
$$

Therefore:

$$
(f + g)(x) = (x + 5) + x^{3/2}
$$

Part 2: Simplification of the Expression

The combined function is:

$$
(f + g)(x) = x + 5 + x^{3/2}
$$

This expression is already in a simplified form because:

- The terms are not like terms and cannot be combined algebraically.
- The expression is clear and explicitly shows the sum of a linear term and a fractional power term.

Final Simplified Formula:

$$
\boxed{
(f + g)(x) = x + 5 + x^{3/2}
}
$$

Part 3: Determining the Domain of $(f + g)(x)$

Understanding the domain of the sum involves considering the domains of the individual functions.

Domain of $F(x)$:

- All real numbers, $\mathbb{R}$, since no restrictions exist.

Domain of $G(x)$:

- $x \geq 0$, because the square root of a negative number is not real in the context of real-valued functions.

Domain of $(f + g)(x)$:

- The sum is defined only where both functions are defined.
- Since $F(x)$ is defined everywhere, but $G(x)$ is only defined for $x \geq 0$, the overall domain is:

$$
\boxed{
x \geq 0
}
$$

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

$$
\boxed{
[0, \infty)
}
$$

Visualizing the Function

While a detailed graph isn't part of this article, envisioning the combined function helps:

- For $x \geq 0$, the function starts at $x=0$:
$$
(f + g)(0) = 0 + 5 + 0^{3/2} = 5 + 0 = 5
$$
- As x increases:
- The linear component $x + 5$ increases steadily.
- The fractional power $x^{3/2}$ grows faster than linear for large x because of the exponent $3/2$, which combines a square root and cube.

Real-World Applications and Relevance

Understanding how to combine functions and analyze their domains is fundamental in many scientific and engineering disciplines:

- Engineering: Designing systems where different components have behaviors modeled by functions, and their combined output must be analyzed within specific input ranges.
- Physics: Calculating total energy or force where different laws apply over different ranges.
- Data Analysis: Combining models that operate over specific data ranges, ensuring the combined model is valid only within those ranges.

Summary and Key Takeaways

- The combined function $(f + g)(x)$ for $F(x) = x + 5$ and $G(x) = x^{3/2}$ is:

$$
\boxed{
(f + g)(x) = x + 5 + x^{3/2}
}
$$

- This expression is already in simplified form.
- The domain of this combined function is $x \geq 0$, reflecting the domain restrictions of $G(x)$.
- Understanding the domain is crucial when applying functions to real-world problems, as it defines where the model or calculation is valid.

This exploration demonstrates the elegance and complexity of combining functions, emphasizing the importance of domain considerations. Whether you're a student, educator, or professional, mastering these concepts enhances your mathematical toolkit, empowering you to model, analyze, and interpret a wide array of phenomena with confidence.

F X X 5 And G X X 3 2 Find The Formula For F G X And Simplify Your Answer Then Find The Domain

F X X 5 And G X X 3 2 Find The Formula For F G X And Simplify Your Answer Then Find The Domain

Related Articles

- Fargus Corporation Owned 51% Of The Voting Common Stock Of Sanatee, Inc. The Parents Interest Was Acquired
- Find The Interval Containing X=0 Where F(x)=16xtan(x) Is Increasing. Write Your Answer As An Open Interval
- PLEASE HURRYHow Did President Andrew Jackson Promote Democracy During His Presidency? Explain Your Answer.

Back to Home