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Understanding functions is a fundamental aspect of algebra and mathematics as a whole. Functions describe relationships between variables, typically mapping inputs to outputs. In this guide, we will explore the functions F(x) and G(x), analyze their expressions, and understand how to compute the combined function H(x) = F(x) + G(x). This comprehensive explanation will cover the definitions, methods of combining functions, and practical examples to solidify your understanding.

Understanding the Functions F(x) and G(x)

Before delving into the combination of functions, it's crucial to clarify what the functions F(x) and G(x) represent. Based on the provided expressions, there appears to be some inconsistency or typographical errors, but we can interpret the intended functions as follows:

- F(x) = 2x - 1
- G(x) = 7x - 12

These are linear functions, each with a slope and y-intercept, commonly used in algebra to model relationships that change at a constant rate.

Clarifying Ambiguities in the Expressions

The initial expression appears garbled: "F(x) = 2x - 1gx) = 7x - 12." This could be a typo or formatting error. Assuming the intended functions are:

- F(x) = 2x - 1
- G(x) = 7x - 12

This assumption aligns with typical function notation and allows us to proceed with combining these functions.

What Is a Function? A Quick Overview

A function is a relation that assigns exactly one output to each input from its domain. In algebra, functions are often expressed as formulas involving variables, like F(x) or G(x).

Key points about functions:

- They have a domain (set of input values).
- They have a rule that assigns each input to a single output.
- They can be represented graphically, algebraically, or verbally.

Adding Functions: The Concept of H(x) = F(x) + G(x)

The operation of adding two functions results in a new function, denoted as H(x), defined as:

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

This means that for each value of x, H(x) is the sum of the outputs of F(x) and G(x):

$$ H(x) = \text{(value of F at x)} + \text{(value of G at x)} $$

Why is this important? Adding functions allows us to model combined phenomena, such as total costs, combined rates, or aggregate quantities in real-world applications.

How to Find H(x) = F(x) + G(x)

To compute H(x), follow these steps:

1. Write down the expressions for F(x) and G(x).
2. Add the corresponding expressions algebraically.
3. Simplify the resulting expression to get the formula for H(x).

Calculating H(x) = F(x) + G(x) for the Given Functions

Given:

- F(x) = 2x - 1
- G(x) = 7x - 12

The combined function H(x) is:

$$ H(x) = (2x - 1) + (7x - 12) $$

Let's compute this step-by-step.

Step 1: Combine like terms

$$
H(x) = 2x - 1 + 7x - 12
$$

Step 2: Group similar terms

$$
H(x) = (2x + 7x) + (-1 - 12)

\]

Step 3: Simplify each group

$$
H(x) = 9x - 13
$$

Result:

$$
\boxed{H(x) = 9x - 13}
$$

This is the function that describes the combined output of F and G for any input x.

Interpreting H(x) = 9x - 13

The resulting function H(x) = 9x - 13 is a linear function with a slope of 9 and a y-intercept of -13.

What does this mean?

- Slope (9): For each increase of 1 in x, H(x) increases by 9.
- Y-intercept (-13): When x = 0, H(x) equals -13.

This function can be used for various practical purposes, such as calculating total revenue, combined expenses, or other quantities that depend linearly on a variable.

Graphing the Functions: Visualizing F(x), G(x), and H(x)

Graphing helps to visualize how functions behave and relate to each other.

Graph of F(x) = 2x - 1

- Slope: 2 (rise over run)
- Y-intercept: -1

Graph of G(x) = 7x - 12

- Slope: 7
- Y-intercept: -12

Graph of H(x) = 9x - 13

- Slope: 9
- Y-intercept: -13

Key insights:

- All three are straight lines.
- The slope of H(x) is the sum of the slopes of F(x) and G(x), which aligns with linear function addition rules.
- The lines will intersect the y-axis at their respective intercepts.

Practical tip for plotting:

- Plot the y-intercepts first.
- Use the slopes to find other points.
- Draw the lines, noting that H(x) has the steepest slope among the three.

Real-World Applications of Adding Functions

Adding functions like F(x) and G(x) can model various real-world scenarios, including:

- Financial calculations: Total income or expenses from multiple sources.
- Physics: Combining velocities or forces.
- Economics: Summing demand or supply functions.
- Engineering: Total cost functions, combining fixed and variable costs.

Examples:

1. Total Revenue: If F(x) represents revenue from product A and G(x) from product B, then H(x) gives total revenue.
2. Combined Rate: If F(x) and G(x) represent rates of work for two workers, then H(x) indicates their combined work rate.

Practice Problems to Reinforce Learning

To deepen understanding, try solving the following:

1. Find H(x) if F(x) = 3x + 4 and G(x) = -2x + 7.
2. Calculate H(5) using the above functions.
3. Graph F(x), G(x), and H(x) on the same coordinate plane.
4. Interpret the meaning of the slope of H(x) in different contexts.

Conclusion

Adding functions is a fundamental operation in algebra that allows us to analyze combined relationships and quantities. By understanding how to combine linear functions like F(x) = 2x - 1 and G(x) = 7x - 12, we derive the new function H(x) = 9x - 13, which captures the sum of their outputs for any input x. Visualizing these functions through graphs enhances comprehension, and recognizing their practical applications emphasizes their importance in various fields.

Whether you're solving simple algebra problems or modeling complex real-world systems, mastering the addition of functions enhances your problem-solving toolkit. Keep practicing with different functions to develop fluency and confidence in working with function operations.

Remember: The key steps involve writing down the functions, combining like terms, simplifying, and interpreting the results. With consistent practice, you'll become proficient in manipulating and understanding functions in algebra and beyond.

Frequently Asked Questions

How do you find H(x) = F(x) + G(x) given the functions F(x) = 2x - 1 and G(x) = 7x - 12?

To find H(x), add the two functions: H(x) = (2x - 1) + (7x - 12) = (2x + 7x) + (-1 - 12) = 9x - 13.

What is the simplified form of H(x) = F(x) + G(x) when F(x) = 2x - 1 and G(x) = 7x - 12?

The simplified form of H(x) is 9x - 13.

If F(x) = 2x - 1 and G(x) = 7x - 12, what is the value of H(3)?

H(3) = 9(3) - 13 = 27 - 13 = 14.

Are F(x) and G(x) linear functions, and what does their sum H(x) look like?

Yes, both F(x) and G(x) are linear functions, and their sum H(x) is also linear, with the form H(x) = 9x - 13.

How does combining F(x) and G(x) affect the slope and intercept of the resulting function H(x)?

Combining F(x) and G(x) adds their slopes (2 + 7 = 9) and adds their intercepts (-1 + -12 = -13), resulting in a new linear function with slope 9 and intercept -13.

Can I use this method to add any two linear functions F(x) and G(x)?

Yes, adding any two linear functions involves summing their respective slopes and intercepts to find the resulting linear function H(x).

Additional Resources

Mathematics: Unlocking the Power of Function Composition and Analysis

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Introduction: Understanding the Fundamentals of Functions

Mathematics is a language of patterns, relationships, and structures that describe the world around us. Among its core concepts are functions, which are mathematical entities that relate inputs to outputs. In everyday terms, a function can be viewed as a machine: you input a number, and the machine produces an output based on a specific rule.

Understanding functions is crucial because they form the backbone of advanced topics in algebra, calculus, and applied sciences. In this article, we will explore a particular set of functions—namely, F(x) and G(x)—and analyze their combined form, H(x). This exploration will demonstrate how functions interact, combine, and reveal deeper insights into algebraic structures.

Deciphering the Functions: F(x) and G(x)

Given Functions and Their Significance

The functions under consideration are:

- F(x) = 2x - 1
- G(x) = 7x - 12

At first glance, both are linear functions, characterized by their slope and intercept:

- F(x) has a slope of 2 and a y-intercept at -1.
- G(x) has a slope of 7 and a y-intercept at -12.

These functions are straightforward but form the basis for understanding more complex operations such as addition, composition, and transformation.

The Nature of Linear Functions

Linear functions are among the simplest in algebra, with the general form:

$$ y = mx + b $$

where:

- m is the slope, indicating the rate of change.
- b is the y-intercept, the point where the line crosses the y-axis.

F(x) and G(x) are both of this form, and their properties are:

Function	Slope (m)	Y-intercept (b)	Key Characteristics
F(x)	2	-1	Steeper than G(x), intercepts at (0, -1)
G(x)	7	-12	Much steeper, intercepts at (0, -12)

Understanding these attributes helps predict how the functions behave graphically and algebraically.

Combining Functions: What Is H(x)?

Defining H(x)

The operation involves creating a new function H(x) by adding F(x) and G(x):

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

Substituting the given functions:

$$
H(x) = (2x - 1) + (7x - 12)
$$

The goal is to simplify this expression and interpret its meaning.

Simplification of H(x)

Combine like terms:

$$
H(x) = 2x - 1 + 7x - 12
$$
$$
H(x) = (2x + 7x) + (-1 - 12)
$$
$$
H(x) = 9x - 13
$$

Thus, the function H(x) simplifies to:

$$
\boxed{H(x) = 9x - 13}
$$

\]

This is a new linear function with a slope of 9 and a y-intercept at -13.

Interpreting H(x): Insights and Implications

Graphical Perspective

Graphically, $H(x)$ is a line with a slope of 9, indicating a rapid increase as x increases. Its intercept at -13 suggests it crosses the y-axis below the origin. When plotted:

- For $x = 0$, $H(0) = -13$.
- For $x = 1$, $H(1) = 9(1) - 13 = -4$.
- For $x = 2$, $H(2) = 18 - 13 = 5$.

This progression demonstrates a steep upward trend, visually confirming the combined effect of the slopes of $F(x)$ and $G(x)$.

Algebraic Significance

Adding functions like $F(x)$ and $G(x)$ corresponds to combining their effects. The resulting slope, 9, reflects the sum of the individual slopes:

$$
m_{H} = m_{F} + m_{G} = 2 + 7 = 9
$$

The intercept -13 is the sum of their intercepts:

$$
b_{H} = b_{F} + b_{G} = -1 + (-12) = -13
$$

This illustrates a fundamental property of linear functions: the sum of two linear functions is also linear, with slope and intercept being the sums of the individual slopes and intercepts.

Applications and Broader Contexts

Practical Uses of Function Addition

Adding functions like $F(x)$ and $G(x)$ is more than an algebraic exercise; it mirrors real-world situations where multiple factors contribute to an outcome. Examples include:

- Economics: Summing supply and demand functions to understand combined market behavior.
- Physics: Combining velocity components in different directions.
- Engineering: Adding signals or forces modeled by linear functions.

Exploring Function Composition and Transformation

While this article focuses on addition, similar principles apply to:

- Function composition: Applying one function to the result of another, such as $(F \circ G)(x) = F(G(x))$.
- Transformations: Shifting, stretching, or reflecting functions graphically.

Understanding these operations enhances problem-solving skills and deepens comprehension of linear algebra structures.

Advanced Considerations and Extensions

Other Operations with F(x) and G(x)

Beyond addition, functions can be combined through:

- Subtraction: $F(x) - G(x)$
- Multiplication: $F(x) \times G(x)$
- Division: $\frac{F(x)}{G(x)}$, provided $G(x) \neq 0$
- Composition: $F(G(x))$ or $G(F(x))$

Each operation reveals different properties and behaviors.

Implications of Non-Linear Extensions

While F(x) and G(x) are linear, introducing non-linear functions (quadratic, exponential, logarithmic) expands the complexity and application scope. For example, combining linear and quadratic functions yields parabolic shapes, critical in modeling projectile motion or optimization problems.

Summary and Key Takeaways

- $F(x) = 2x - 1$ and $G(x) = 7x - 12$ are linear functions characterized by their slopes and intercepts.
- Their sum, $H(x) = F(x) + G(x)$, simplifies to $H(x) = 9x - 13$, which is itself a linear function.

- The slope of H(x) (9) is the sum of the individual slopes (2 + 7), and the intercept (-13) is the sum of the individual intercepts (-1 + -12).
- Graphically, H(x) demonstrates a steeper incline than either F(x) or G(x) alone.
- Such operations have broad applications across science, engineering, and economics, illustrating the interconnectedness of mathematical concepts.

Final Thoughts: The Power of Simplicity and Combination

This exploration of functions underscores a fundamental principle in mathematics: complex systems can often be understood through simple components and their interactions. By mastering operations such as addition, students and professionals can simplify problems, model real-world phenomena, and develop deeper insights into the structures that govern various disciplines.

Understanding F(x), G(x), and their sum H(x) provides a solid foundation for further study in algebra, calculus, and beyond. Whether predicting trends, designing systems, or solving equations, the ability to analyze and combine functions remains a vital skill—highlighting the elegance and utility of mathematics in both theory and practice.

F X 2x 1gx 7x 12what Is H X F X G X

F X 2x 1gx 7x 12what Is H X F X G X

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