If F(x) = −x + 3x + 5 And G(x) = X + 2x, Which Graph Shows The Graph Of (f+g)(x)?864-2Du6424-2499 99-8HE00268x

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Understanding how to combine functions and interpret their graphs is a fundamental aspect of algebra and calculus. In this comprehensive guide, we'll explore the functions F(x) and G(x), how to compute their sum (f + g)(x), and how to accurately identify its graph among multiple options. Whether you're a student preparing for exams or someone interested in mastering function analysis, this article provides detailed insights to enhance your understanding.

Analyzing the Given Functions

Before we can determine the graph of (f + g)(x), it's essential to understand the individual functions F(x) and G(x). Let's analyze each function carefully.

Understanding F(x) = −x + 3x + 5

At first glance, the function F(x) appears complex due to the expression "−x + 3x + 5." However, algebraic simplification makes it straightforward.

- Combine like terms:

$-x + 3x = 2x$

- Therefore,

$F(x) = 2x + 5$

This simplifies our analysis, revealing that F(x) is a linear function with a slope of 2 and a y-intercept of 5.

Understanding G(x) = X + 2x

The function G(x) is given as "X + 2x." Assuming "X" is a variable representing x, the expression simplifies similarly:

- $G(x) = x + 2x = 3x$

This is a linear function with a slope of 3 and passes through the origin (0,0).

Calculating the Sum Function (f + g)(x)

To find (f + g)(x), we add the two functions F(x) and G(x):

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

Using the simplified forms:

- $(f + g)(x) = (2x + 5) + 3x$

Combine like terms:

- $2x + 3x = 5x$

- So,

$(f + g)(x) = 5x + 5$

This is a linear function with a slope of 5 and y-intercept of 5.

Graphing (f + g)(x): Key Features

Understanding the characteristics of the combined function's graph is crucial for proper identification.

1. Slope and Intercept

- Slope (m): 5

- Y-intercept (b): 5

- The line crosses the y-axis at (0, 5) and rises 5 units vertically for every 1 unit horizontally.

2. Behavior of the Graph

- Since the slope is positive, the line ascends from left to right.

- The intercept at (0, 5) serves as the starting point.

3. Additional Points for Plotting

To accurately plot the line, identify additional points:

- For example, at x = 1:

$(f + g)(1) = 5(1) + 5 = 10 \rightarrow$ point (1, 10)

- At x = -1:

$(f + g)(-1) = 5(-1) + 5 = 0 \rightarrow$ point (-1, 0)

Plotting these points alongside the intercept provides a clear line.

Interpreting Graph Options and Choosing the Correct Graph

In typical multiple-choice questions, several graphs are presented. To identify the correct one, compare the key features:

Criteria for Correct Graph

1. Line passes through (0, 5)
2. Slope of 5, indicating a steep incline
3. Additional points match the calculated values, such as (1, 10) and (-1, 0)

Common Mistakes to Watch For

- Graphs with incorrect intercepts, e.g., crossing the y-axis at a point other than 5.

- Slopes that do not match the calculated slope (e.g., a slope of 1, 2, or 3).

- Graphs that are not straight lines (indicating nonlinear functions).

- Confusing the original functions with their sum; ensure the graph reflects $(f + g)(x)$, not $F(x)$ or $G(x)$ individually.

Step-by-Step Approach to Verify the Correct Graph

To confidently select the correct graph, follow this verification process:

1. Identify the y-intercept: check if the graph crosses at (0, 5).

2. Determine the slope: examine the rise over run between two points; it should be 5.

3. Plot additional points: verify if other points align with the calculated values (e.g., at x=1, y=10).

4. Compare the overall line: ensure the line is straight and consistent with the calculated slope and intercept.

Additional Concepts Related to Function Graphs

Understanding how to interpret and manipulate functions graphically involves several important concepts:

Linear Functions

- Represented by straight lines.

- The general form: y = mx + b, where m is the slope, b is the y-intercept.

- Key features: slope, intercepts, and points for plotting.

Adding Functions

- When two functions are added, their graphs combine to produce a new linear function if both are linear.

- The sum's slope is the sum of individual slopes.

- The sum's intercept is the sum of individual intercepts, assuming all functions are linear.

Graph Consistency Checks

- Always verify the key features of the combined graph to ensure accuracy.

- Use multiple points to confirm the straightness and slope.

- Cross-reference the graph with the algebraic results.

Practical Applications of Function Graphs

Understanding how to analyze and identify graphs of combined functions has real-world applications:

- **Economics**: Combining cost functions to analyze total costs.
- **Physics**: Summing velocity functions to get total velocity over time.
- **Statistics**: Aggregating data trends from multiple sources.
- **Engineering**: Summing signals or forces represented graphically.

Mastering the interpretation of function graphs allows professionals and students to make informed decisions based on visual data.

Conclusion

In summary, given the functions $F(x) = -x + 3x + 5$ and $G(x) = X + 2x$, which simplify to $F(x) = 2x + 5$ and $G(x) = 3x$ respectively, their sum $(f + g)(x)$ simplifies to $5x + 5$. The graph of this sum is a straight line passing through $(0, 5)$ with a slope of 5. By analyzing key features such as intercepts and slopes, and verifying points, you can confidently identify the correct graph from multiple options.

Understanding these steps enhances your ability to analyze combined functions efficiently—an essential skill in mathematics, science, and numerous real-world applications. Keep practicing by analyzing various functions and their sums to build a strong foundation in graphical analysis.

Remember: Always start by simplifying the functions, calculating their sum algebraically, and then translating those algebraic features into visual graph characteristics. This systematic approach ensures accuracy and confidence in your mathematical reasoning.

Frequently Asked Questions

How do we find the graph of (f + g)(x) given the functions F(x) and G(x)?

To find the graph of $(f + g)(x)$, we first simplify the functions $F(x)$ and $G(x)$, then add their expressions algebraically. The resulting function's graph will be the sum of the two original graphs.

What are the simplified forms of F(x) and G(x) in the given problem?

F(x) = -x + 3x + 5 simplifies to 2x + 5, and G(x) = x + 2x simplifies to 3x.

What is the expression for (f + g)(x) based on the simplified functions?

(f + g)(x) = F(x) + G(x) = (2x + 5) + (3x) = 5x + 5.

Which graph corresponds to the function (f + g)(x) = 5x + 5?

The graph is a straight line with a slope of 5 and a y-intercept at 5, indicating a steeply increasing line crossing the y-axis at 5.

How can we verify that the graph matches (f + g)(x) = 5x + 5?

By plotting the line with slope 5 and y-intercept 5 or by checking points such as (0, 5) and (1, 10) on the graph to ensure they satisfy the equation.

What is the significance of understanding how to combine functions like F(x) and G(x)?

Combining functions helps us understand the overall behavior of combined systems, and it's fundamental in graphing, solving equations, and analyzing real-world phenomena involving multiple variables.

Additional Resources

If F(x) = -x + 3x + 5 And G(x) = X + 2x, Which Graph Shows The Graph Of (f+g)(x)?
Understanding the combined behavior of functions and their graphical representations is a fundamental aspect of algebra and calculus. When given two functions, such as F(x) and G(x), and asked to determine the graph of their sum, (f + g)(x), it is essential to analyze each component carefully. This process involves simplifying each function, combining them algebraically, and then translating that algebraic expression into a visual graph. This article provides a comprehensive review of how to approach this problem, including step-by-step calculations, graphing techniques, and tips for identifying the correct visual representation among multiple options.

Analyzing the Given Functions

Before delving into the combination and graphing process, it is vital to understand the individual functions provided:

- F(x) = -x + 3x + 5

- $G(x) = X + 2x$

Note: The notation uses both lowercase and uppercase 'X' for the variable, which is a common source of confusion. For clarity, we assume 'X' and 'x' refer to the same variable and standardize on 'x.'

Simplifying F(x)

Let's simplify F(x):

$F(x) = -x + 3x + 5$
$= (-x + 3x) + 5$
$= 2x + 5$

This is a linear function with a slope of 2 and a y-intercept of 5.

Simplifying G(x)

$G(x) = x + 2x$
$= 3x$

This is a linear function with a slope of 3 and passes through the origin (0,0).

Summary:

Function	Simplified Form	Slope	Y-intercept	Key Features
F(x)	2x + 5	2	5	Line crossing y-axis at 5, slope 2
G(x)	3x	3	0	Line crossing origin, steeper slope

Finding (f + g)(x)

The sum of the functions is:

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

Substituting the simplified forms:

$(f + g)(x) = (2x + 5) + (3x)$
$= 2x + 5 + 3x$
$= (2x + 3x) + 5$
$= 5x + 5$

This combined function, (f + g)(x), exhibits a slope of 5 and a y-intercept of 5.

Key characteristics:

- Slope = 5 (steeper than either F(x) or G(x))
- Y-intercept = 5

This means the graph of (f + g)(x) is a straight line crossing the y-axis at 5 and rising five units vertically for each unit increase in x.

Graphical Representation of (f + g)(x)

Given the algebraic form, the graph of (f + g)(x) = 5x + 5 is straightforward to plot:

- The y-intercept point: (0, 5)
- The slope: for each increase of 1 in x, y increases by 5

Plotting these points and drawing a straight line through them provides the visual of (f + g)(x).

Features to identify in the correct graph:

- Line passing through (0, 5)
- Steep slope (rising sharply)
- Extends infinitely in both directions

Comparing Graph Options

Suppose you are presented with multiple graphs, each depicting different lines. The goal is to select the one representing (f + g)(x). The key points to compare include:

- Does the line pass through (0, 5)?
- Is the slope consistent with 5?
- Is the line steep enough to match the slope?

Using these criteria, eliminate options that do not intersect the y-axis at 5 or that have slopes inconsistent with 5.

Potential Graph Features and Pitfalls

Pros of Correct Graph:

- Accurate y-intercept at (0, 5)
- Slope corresponds visually with a steep incline
- Passes through expected points derived from the algebraic form

Cons or Common Mistakes:

- Misreading the y-intercept (e.g., y-intercept at 0 or 1)
- Confusing the slope with that of F(x) or G(x) alone
- Choosing a graph with incorrect steepness or intercepts

Tips for Accurate Identification:

- Always verify the y-intercept first
- Use the slope to estimate the angle of inclination
- Check multiple points if possible (e.g., x=1: y=5(1)+5=10)

Additional Considerations

When analyzing graphs, consider the following:

- Linearity: All given functions are linear; their sums will also be linear.
- Steepness: The sum function’s slope should be the sum of individual slopes.
- Intercepts: Confirm the intercepts match the algebraic calculations.

Practical Strategies for Graph Identification

- Identify key points: Calculate and plot a couple of points from the algebraic equation.
- Compare slopes visually: Use the rise over run to assess steepness.
- Check intercepts: Ensure the graph crosses the y-axis at y=5.
- Eliminate inconsistent options: Discard graphs that do not meet these criteria.

Conclusion

In summary, the graph of (f + g)(x) where F(x) = 2x + 5 and G(x) = 3x is a straight line with the equation y = 5x + 5. It features a y-intercept at 5 and a slope of 5, making it steeper than either of the individual functions. When choosing the correct graph among multiple options, focus on verifying the y-intercept and slope. This process not only reinforces understanding of function addition but also enhances skills in interpreting and analyzing graph representations.

Final note: Always double-check your algebraic work and use key points to validate the graphical features. With practice, identifying the correct graph becomes intuitive, aiding in a deeper understanding of linear functions and their combinations.

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