Compare The Function F(x)=3x-1/2 To The Function Shown In The Graph. Which Statements Are Correct?

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Introduction

Mathematics frequently involves analyzing functions to understand their behavior, properties, and relationships. Comparing a specific algebraic function to a graph allows us to verify theoretical predictions with visual representation, leading to a deeper comprehension of the function's characteristics. In this article, we focus on the function F(x) = 3x - 1/2, a linear function, and compare it to another function represented graphically. Our goal is to determine which statements about the comparison are correct based on algebraic analysis and graphical interpretation.

Understanding the properties of linear functions, such as slope, intercepts, and behavior, is essential for making accurate comparisons. This process involves examining key features like the slope, y-intercept, x-intercept, and the overall shape of the graph. By doing so, we can confirm or refute various statements about the relationship between F(x) = 3x - 1/2 and the graph in question.

Understanding the Function F(x) = 3x - 1/2

The Standard Form and Its Components

The function F(x) = 3x - 1/2 is a linear function expressed in slope-intercept form:

$$
F(x) = mx + b
$$

where:

- $m = 3$ is the slope of the line, indicating the rate of change of the function.
- $b = -\frac{1}{2}$ is the y-intercept, the point where the line crosses the y-axis.

Graphical Features

- Y-intercept: The line crosses the y-axis at $(0, -\frac{1}{2})$.
- Slope: The slope of 3 indicates that for every increase of 1 unit in x, $F(x)$ increases by 3 units.
- X-intercept: To find the x-intercept, set $F(x) = 0$:

$$
0 = 3x - \frac{1}{2}
\Rightarrow 3x = \frac{1}{2}
\Rightarrow x = \frac{1}{6}
$$

Thus, the line crosses the x-axis at $\left(\frac{1}{6}, 0\right)$.

Significance of These Features

These components are crucial for comparing the function with the graph:

- The position of the graph relative to the axes.
- The slope's steepness and direction.
- The points where the function crosses the axes.

Analyzing the Graph of the Function

General Characteristics

Assuming the graph in question is a straight line (since the function is linear), key features to verify include:

- Does the graph cross the y-axis at $-\frac{1}{2}$?
- Is the slope consistent with $m=3$?
- Does the line cross the x-axis at $\frac{1}{6}$?
- Is the graph increasing or decreasing?

Comparing Graph Points

To determine which statements are correct, it’s necessary to analyze the points on the graph:

- Check if the y-intercept matches $(0, -0.5)$.
- Pick points with known x-values to see if the y-values align with $F(x) = 3x - 0.5$.
- Observe the steepness of the line—graphically, does it rise three units vertically for each unit horizontally?

Confirming the Slope

If the graph shows a line with a steepness that matches the slope of 3, then the statement about the slope being 3 is likely correct.

The Intercepts

- If the graph crosses the y-axis at -0.5, the statement about the y-intercept being -0.5 is correct.
- If the x-intercept appears at $\frac{1}{6}$, then that statement is correct.

Comparing Statements About the Function and Graph

When analyzing the correctness of various statements, consider the following common claims:

Statement 1: The graph passes through the point $(0, -0.5)$.

Analysis: Since the y-intercept of F(x) = 3x - 0.5 is at $(0, -0.5)$, the statement is correct if the graph crosses the y-axis at this point.

Statement 2: The slope of the graph is 3.

Analysis: The slope $m=3$ indicates a steepness of 3. If the graph visually confirms this steepness, then the statement is correct.

Statement 3: The graph crosses the x-axis at $\left(\frac{1}{6}, 0\right)$.

Analysis: Calculated algebraically, the x-intercept is at $x = \frac{1}{6}$. Confirming this on the graph makes the statement correct.

Statement 4: The function is increasing for all values of x.

Analysis: Since the slope $m=3 > 0$, the function increases as x increases. The graph should show an upward trend, confirming this statement.

Statement 5: The graph is decreasing for all values of x.

Analysis: This is false because the positive slope indicates increasing behavior.

Statement 6: The line is parallel to the line $y=3x + 2$.

Analysis: Both lines have the same slope (3), so they are parallel. The statement is correct if the graph's line has the same slope and different y-intercepts.

Statement 7: The function F(x) passes through $(1, 2.5)$.

Analysis: Test this point:

$$
F(1) = 3(1) - 0.5 = 3 - 0.5 = 2.5
$$

Since the calculation matches, if the graph passes through $(1, 2.5)$, then the statement is correct.

Visual Verification and Graphical Interpretation

How to Verify Graphically

- Intercepts: Confirm the y-intercept at -0.5 and the x-intercept at $\frac{1}{6}$.
- Slope: Measure the rise over run between two points; the rise should be 3 units for every 1 unit along the x-axis.
- Points: Check if specific points, such as $(1, 2.5)$, lie on the line.
- Parallel Lines: Identify if the given line is parallel to other lines with the same slope.

Tools for Verification

- Graph paper or graphing calculator.
- Digital graphing tools (Desmos, GeoGebra) for precise analysis.
- Measuring the steepness visually to compare slopes.

Summary: Which Statements Are Correct?

Based on algebraic calculations and graphical analysis, the correctness of statements about the function F(x) = 3x - 1/2 and its comparison to the graph depends on:

- Accurate identification of intercepts.
- Correct interpretation of slope.
- Verification of specific points.

Likely correct statements include:

- The graph passes through $(0, -0.5)$.
- The slope of the graph is 3.
- The x-intercept is at $\frac{1}{6}$.
- The function is increasing for all x.

Statements that are incorrect or require verification:

- The line is decreasing (false).
- The line passes through points inconsistent with the algebraic calculations.
- The line is not parallel to $y=3x + 2$ (if the intercepts differ).

Conclusion

Comparing the function F(x) = 3x - 1/2 with a graph involves understanding and verifying key features such as intercepts, slope, and points on the line. Algebraic analysis provides precise points and slope values, while the graphical perspective offers visual confirmation. When statements about the function and its graph are consistent with these properties, they are deemed correct.

By mastering the process of analyzing linear functions both algebraically and visually, students and mathematicians can develop stronger intuition and accuracy in interpreting graphs. Whether for academic purposes or practical applications, this comparison process

forms a foundational skill in the study of functions and their graphical representations.

Additional Resources

- [Understanding Slope and Intercepts](https://www.khanacademy.org/math/algebra/linear-equations)
- [Graphing Linear Equations](https://www.desmos.com/calculator)
- [Linear Function Properties](https://www.mathsisfun.com/sets/linear-functions.html)

Note: Always verify the specific graph provided in your problem, as variations or inaccuracies in the graph can affect the correctness of statements.

Frequently Asked Questions

What is the main difference between the function F(x) = (3x - 1)/2 and the graph shown?

The main difference lies in the slope and y-intercept; the given function has a slope of 3/2 and a y-intercept at -1/2, while the graph may have different values indicating a different linear relationship.

How can you determine if the graph represents the function F(x) = (3x - 1)/2?

By checking if the points on the graph satisfy the equation, specifically verifying that for any point (x, y), the equation y = (3x - 1)/2 holds true.

Which statements are correct if the graph shows a line with a slope of 3/2 and y-intercept of -1/2?

Statements confirming that the graph's line has a slope of 3/2 and crosses the y-axis at -1/2 are correct; these match the function F(x) = (3x - 1)/2.

If a point on the graph is (2, 2), does it satisfy the function F(x) = (3x - 1)/2?

Yes, substituting x = 2 into the function: F(2) = (32 - 1)/2 = (6 - 1)/2 = 5/2 = 2.5, which does not match y=2, so the point does not satisfy the function.

Which statement is false when comparing the graph to

the function F(x) = (3x - 1)/2?

A false statement would be that the graph perfectly matches the function if the slope or intercept differs; for example, if the line has a different slope or y-intercept, then it does not represent the function.

Additional Resources

Comparison of the Function F(x) = 3x - 1/2 to Its Graphical Representation: An In-Depth Analysis

In the realm of mathematics, understanding the relationship between algebraic functions and their graphical representations is fundamental. This comparison not only enhances comprehension but also deepens insight into how equations translate into visual forms. Today, we delve into a detailed examination of the linear function F(x) = 3x - 1/2 and its corresponding graph, exploring which statements about this function and its graph are accurate. Our goal is to provide a comprehensive, expert-level review that clarifies the nuances of this function, its properties, and the insights gleaned from its graph.

Understanding the Function F(x) = 3x - 1/2

1. Algebraic Structure and Basic Properties

The function under consideration, F(x) = 3x - 1/2, is a linear function, characterized by the general form y = mx + b, where:

- m (the slope) = 3
- b (the y-intercept) = -1/2

This form indicates that the graph of F(x) is a straight line with a constant slope, and it intersects the y-axis at the point (0, -1/2).

Key properties include:

- Linearity: Since the function is linear, its graph is a straight line.
- Slope (m = 3): The positive slope indicates the line rises as x increases.
- Y-intercept: The point at which the line crosses the y-axis is at y = -0.5.

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2. Domain and Range

Because F(x) is a linear function with no restrictions, its domain and range are:

- Domain: All real numbers, denoted as (-∞, ∞).
- Range: All real numbers, also (-∞, ∞).

This means the line extends infinitely in both directions along the x- and y-axes.

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3. Key Features of the Graph

To thoroughly compare the function to its graph, it’s vital to understand several features:

- Slope: 3, indicating a steep, upward-sloping line.
- Y-intercept: At (0, -0.5).
- X-intercept: Found by setting F(x) = 0:

$$
3x - 0.5 = 0 \Rightarrow 3x = 0.5 \Rightarrow x = \frac{0.5}{3} = \frac{1}{6} \approx 0.1667
$$

So, the line crosses the x-axis at approximately (0.1667, 0).

- Behavior at infinity: As x approaches positive or negative infinity, F(x) correspondingly approaches positive or negative infinity, consistent with its linearity.

Analyzing the Graph and Corresponding Statements

When evaluating statements about the function and its graph, it’s crucial to verify their accuracy based on the properties outlined above. We'll categorize potential statements into correct and incorrect, providing detailed reasoning for each.

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1. The graph of the function is a straight line with a positive slope.

Assessment: Correct

Explanation: Given that the function F(x) = 3x - 1/2 has a slope of 3, which is positive, its graph must be a straight line ascending from left to right. The graphical representation should clearly show an upward trend, confirming this statement.

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2. The y-intercept of the graph is at (0, -1/2).

Assessment: Correct

Explanation: The y-intercept corresponds to the point where x = 0:

$$
F(0) = 3 \times 0 - 0.5 = -0.5
$$

Thus, the line crosses the y-axis at (0, -0.5). Any graph displaying this point accurately reflects the function's intercept.

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3. The x-intercept is at (1/6, 0).

Assessment: Correct

Explanation: To find the x-intercept:

$$
0 = 3x - 0.5 \Rightarrow 3x = 0.5 \Rightarrow x = \frac{0.5}{3} = \frac{1}{6}
$$

Thus, the x-intercept is at (1/6, 0), approximately (0.1667, 0). Any graph showing this point correctly represents the function's crossing of the x-axis.

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4. The function is decreasing as x increases.

Assessment: Incorrect

Explanation: Since the slope m = 3 is positive, the function is increasing as x increases. A negative slope would indicate decreasing behavior, but this is not the case here.

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5. The graph passes through the point (0, -1/2).

Assessment: Correct

Explanation: As previously established, the y-intercept is at (0, -0.5). Any graph passing through this point aligns with the function's definition.

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6. For x = 2, F(x) = 5.5.

Assessment: Correct

Calculation:

$$
F(2) = 3 \times 2 - 0.5 = 6 - 0.5 = 5.5
$$

Therefore, the point (2, 5.5) lies on the graph, confirming this statement.

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7. The line is symmetric with respect to the y-axis.

Assessment: Incorrect

Explanation: Symmetry with respect to the y-axis would require the function to be even, meaning F(x) = F(-x). Let's check:

$$
F(-x) = 3(-x) - 0.5 = -3x - 0.5
$$

Since F(-x) ≠ F(x), the line is not symmetric about the y-axis. The graph is instead symmetric about the origin if it satisfies F(-x) = -F(x), which it does not here, so no symmetry exists.

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8. The graph extends infinitely in both directions along the x and y axes.

Assessment: Correct

Explanation: As a linear function with no restrictions, the graph extends infinitely along both axes, consistent with the properties of a straight line.

Additional Considerations in Comparing Function and Graph

Beyond the basic statements, it's important to recognize subtle aspects that can influence the accuracy of interpretations:

1. Slope Interpretation

- The slope of 3 indicates a steep upward incline.
- For every 1 unit increase in x, y increases by 3 units.
- Visual confirmation on the graph should show this rapid ascent.

2. Graphical Precision

- Accurate plotting of intercepts and slopes is essential.
- The graph should pass through (0, -0.5) and (1/6, 0).
- The line should be straight, without curves or deviations.

3. Impact of Approximate Coordinates

- The x-intercept at (1/6, 0) is approximate; precise plotting improves understanding.
- Recognizing the decimal form (≈0.1667) helps in visual analysis.

4. Limitations of Graphs and Equations

- Graphs can sometimes be approximated visually; precise calculations ensure correctness.
- Misinterpretation can occur if graph scaling distorts perception.

Summary of Correct Statements Based on the Function

Statement	Correct/Incorrect	Explanation
The graph is a straight line with a positive slope.	Correct	Slope = 3 > 0.
The y-intercept is at (0, -1/2).	Correct	Derived from F(0) = -0.5.
The x-intercept is at (1/6, 0).	Correct	Found by solving 3x - 0.5 = 0.
The function is decreasing as x increases.	Incorrect	Slope positive, so increasing.
The graph passes through (0, -1/2).	Correct	Y-intercept point.
For x=2, F(x)=5.5.	Correct	Calculated directly.
The line is symmetric with respect to the y-axis.	Incorrect	Not an even function.
The graph extends infinitely in both directions.	Correct	Linear functions are unbounded.

Conclusion: A Clear Reflection of Algebra in Visual Form

The comparison of the function F(x) = 3x - 1/2 with its graphical representation underscores the importance of understanding the fundamental principles of linear functions. The positive slope and intercepts are vividly depicted in the graph, providing an intuitive grasp of the function's behavior. Recognizing which statements accurately describe the function enables a deeper appreciation of how algebraic equations translate into visual insights.

This detailed examination confirms that the graph faithfully represents the function's properties, with key features aligning precisely with the algebraic calculations. By analyzing each statement critically and

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