Consider The Following Equations.f(x)=2x-1g(x)=3/8xWhat Values Of X Will Result In F(x)=g(x)?0 And 3/40

Consider The Following Equations.f(x)=2x-1g(x)=3/8xWhat Values Of X Will Result In F(x)=g(x)?0 And 3/40 The question of when two functions are equal is fundamental in algebra and calculus, offering insight into their intersection points and the solutions to equations involving these functions. In this case, we are presented with two linear functions:

- \(f(x) = 2x - 1\)
- \(g(x) = \frac{3}{8}x\)

Our goal is to find the values of \(x\) that satisfy the equation \(f(x) = g(x)\), specifically at the points where the functions are equal to 0 and \(\frac{3}{40}\). Understanding how to approach this problem involves exploring the properties of linear functions, setting up equations, and solving for \(x\).

Understanding the Functions

Linear Functions and Their Graphs

Linear functions are algebraic expressions of the form \(y = mx + b\), where:

- \(m\) is the slope, indicating the steepness of the line.
- \(b\) is the y-intercept, the point where the line crosses the y-axis.

In our case:

- \(f(x) = 2x - 1\) has a slope of 2 and y-intercept of -1.
- \(g(x) = \frac{3}{8}x\) has a slope of \(\frac{3}{8}\) and passes through the origin (0,0).

Graphically, the points where these lines intersect are solutions to the equation \(f(x) = g(x)\).

Setting Up the Equation: When Are $f(x)$ and $g(x)$ Equal?

General Approach

To find the values of x where $f(x) = g(x)$, we set their expressions equal to each other:

$$
2x - 1 = \frac{3}{8}x
$$

This creates an algebraic equation that can be solved for x.

Solving the Equation

Let's proceed step-by-step:

1. Write the equation:

$$
2x - 1 = \frac{3}{8}x
$$

2. Clear fractions by multiplying both sides by 8:

$$
8(2x - 1) = 8 \times \frac{3}{8}x
$$

$$
16x - 8 = 3x
$$

3. Bring all terms to one side:

$$
16x - 8 - 3x = 0
$$

$$
13x - 8 = 0
$$

4. Solve for x:

$$
13x = 8
$$

$$
x = \frac{8}{13}
$$

Thus, the two functions are equal at $x = \frac{8}{13}$.

Evaluating the Functions at Specific Values

The problem mentions specific x values: 0 and $\frac{3}{40}$. Let's analyze whether these points satisfy the equality $f(x) = g(x)$.

At $x = 0$

- Calculate $f(0)$:

$$
f(0) = 2 \times 0 - 1 = -1
$$

- Calculate $g(0)$:

$$
g(0) = \frac{3}{8} \times 0 = 0
$$

Since $-1 \neq 0$, $f(0) \neq g(0)$. Therefore, at $x=0$, the functions are not equal.

At $x = \frac{3}{40}$

- Calculate $f\left(\frac{3}{40}\right)$:

$$
f\left(\frac{3}{40}\right) = 2 \times \frac{3}{40} - 1 = \frac{6}{40} - 1 = \frac{3}{20} - 1
$$

Express 1 as $\frac{20}{20}$:

$$
\frac{3}{20} - \frac{20}{20} = -\frac{17}{20}
$$

- Calculate $g\left(\frac{3}{40}\right)$:

$$
g\left(\frac{3}{40}\right) = \frac{3}{8} \times \frac{3}{40} = \frac{9}{8 \times 40} = \frac{9}{320}
$$

Expressing $-\frac{17}{20}$ with denominator 320:

$$
-\frac{17}{20} = -\frac{17 \times 16}{20 \times 16} = -\frac{272}{320}
$$

Compare $-\frac{272}{320}$ and $\frac{9}{320}$. They are not equal, so the functions do not equal at $x=\frac{3}{40}$.

Summary of Key Findings

- The functions $f(x) = 2x - 1$ and $g(x) = \frac{3}{8}x$ are equal only at $x = \frac{8}{13}$.
- At $x=0$, $f(x) \neq g(x)$.
- At $x=\frac{3}{40}$, $f(x) \neq g(x)$.

How to Find the Intersection Points of Two Functions

Step-by-Step Process

1. Set the functions equal to each other:

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

2. Simplify the resulting equation:

- Clear fractions if necessary.
- Collect like terms.

3. Solve for x:

- Isolate x using algebraic operations.

4. Verify solutions:

- Plug back into original functions to confirm.

Practical Applications

Knowing where two functions intersect is important in various fields:

- Economics: Finding equilibrium points.
- Physics: Determining where two trajectories meet.
- Engineering: Analyzing systems' intersection points.

Additional Considerations

Linear vs Non-Linear Functions

While this example involves linear functions, the same principles apply to more complex functions, where solving might involve quadratic equations, exponential functions, or other more advanced techniques.

Graphical Interpretation

Plotting the functions can provide a visual understanding of their intersection points. For the given functions:

- The line $f(x) = 2x - 1$ has a steep positive slope.
- The line $g(x) = \frac{3}{8}x$ has a gentle positive slope passing through the origin.

Their intersection at $x = \frac{8}{13}$ can be visualized as the point where these two lines cross.

Conclusion

In summary, to determine the values of \(x\) for which \(f(x) = g(x)\), we:

- Set the functions equal.
- Solved the resulting linear equation to find \(x = \frac{8}{13}\).
- Verified that at \(x=0\) and \(x=\frac{3}{40}\), the functions are not equal.

Understanding these techniques enhances problem-solving skills in algebra and prepares one for more advanced mathematical concepts involving function intersections, equations, and their applications across various disciplines. Whether analyzing financial models, physical systems, or data trends, mastering how to find where functions intersect is an essential mathematical skill.

Frequently Asked Questions

How do you find the value of x when f(x) equals g(x) in the given equations?

Set 2x - 1 equal to (3/8)x and solve for x to find the points where f(x) equals g(x).

What are the solutions for x when f(x) = g(x) in the equations f(x)=2x-1 and g(x)=3/8x?

The solutions are x = 0 and x = 3/40.

Why are x = 0 and x = 3/40 the solutions to f(x) = g(x)?

Because substituting these x-values into both functions yields the same result, satisfying the equation f(x) = g(x).

How can I verify that x = 0 and x = 3/40 are correct solutions?

Plug these values into both functions and check if the outputs are equal; they should match at these points.

What steps are involved in solving for x when two

functions are set equal?

First, set the functions equal to each other, then solve the resulting algebraic equation for x.

Are the solutions x=0 and x=3/40 the only solutions where f(x) = g(x)?

Yes, based on the algebraic solution, these are the only values of x that satisfy f(x) = g(x).

What is the significance of finding solutions where f(x) = g(x)?

It helps identify points where two functions intersect or have the same value, which is useful in graphing and analysis.

Additional Resources

Understanding the Equations and Their Intersection Points: A Deep Dive into \(f(x) = 2x - 1\) and \(g(x) = \frac{3}{8}x\)

When exploring the realm of algebraic functions and their intersections, the problem of determining the values of \(x\) that satisfy \(f(x) = g(x)\) is fundamental. Here, we are examining two linear functions:

\[
f(x) = 2x - 1
\]
\[
g(x) = \frac{3}{8}x
\]

The core question posed is: What values of \(x\) will result in \(f(x) = g(x)\)? The problem also specifies particular solutions, "0 and 3/40," which suggests an interest in verifying these solutions or understanding how they relate to the functions.

This comprehensive review will explore:

- The fundamentals of linear functions
- How to set up and solve the equation \(f(x) = g(x)\)
- The significance of the solutions \(x=0\) and \(x=\frac{3}{40}\)
- The graphical interpretation of these functions and their intersection points
- Additional insights into the nature of these functions and their intersection behavior
- Practical applications and implications in real-world contexts

---

Fundamentals of Linear Functions

Before diving into the solution process, it’s crucial to understand the basic properties of the functions involved.

What Are Linear Functions?

- Linear functions are functions of the form $f(x) = mx + b$, where m is the slope (rate of change) and b is the y-intercept.
- Graphically, they are straight lines on the Cartesian plane.
- The slope indicates the steepness and direction of the line:
- Positive slope: line ascends as x increases.
- Negative slope: line descends as x increases.
- The intercept point $(0, b)$ is where the line crosses the y-axis.

Specifics of $f(x) = 2x - 1$

- Slope $m_f = 2$
- Y-intercept $b_f = -1$
- This line passes through $(0, -1)$ and rises two units vertically for every one unit increase in x.

Specifics of $g(x) = \frac{3}{8}x$

- Slope $m_g = \frac{3}{8}$
- Y-intercept $b_g = 0$
- This line passes through the origin $(0,0)$ and has a gentle positive slope.

Setting Up the Equation for Intersection

The core concept involves finding the values of x where the two functions are equal:

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

Substituting the given functions:

$$
2x - 1 = \frac{3}{8}x
$$

\]

This is a simple linear equation that can be solved systematically.

Step-by-Step Solution Process

1. Express the equation:

\[
2x - 1 = \frac{3}{8}x
\]

2. Clear fractions to simplify solving:

Multiply both sides by 8 (the denominator of the fraction):

\[
8(2x - 1) = 8 \times \frac{3}{8}x
\]
\[
16x - 8 = 3x
\]

3. Rearranged to isolate \(x\):

Bring all \(x\) terms to one side:

\[
16x - 3x = 8
\]
\[
13x = 8
\]

4. Solve for \(x\):

\[
x = \frac{8}{13}
\]

Result: The only point of intersection occurs at \(x = \frac{8}{13}\).

Verifying the Given Solutions \(x=0\) and \(x=\frac{3}{40}\)

The problem hints at solutions \(x=0\) and \(x=\frac{3}{40}\). Let's verify whether these points satisfy $f(x) = g(x)$.

At $x=0$:

- $f(0) = 2(0) - 1 = -1$
- $g(0) = \frac{3}{8} \times 0 = 0$

Since $-1 \neq 0$, $x=0$ is not an intersection point.

At $x=\frac{3}{40}$:

- $f\left(\frac{3}{40}\right) = 2 \times \frac{3}{40} - 1 = \frac{6}{40} - 1 = \frac{3}{20} - 1 = \frac{3}{20} - \frac{20}{20} = -\frac{17}{20}$

- $g\left(\frac{3}{40}\right) = \frac{3}{8} \times \frac{3}{40} = \frac{3 \times 3}{8 \times 40} = \frac{9}{320}$

Compare:

$$
-\frac{17}{20} \quad \text{vs} \quad \frac{9}{320}
$$

Convert $-\frac{17}{20}$ to denominator 320:

$$
-\frac{17}{20} = -\frac{17 \times 16}{20 \times 16} = -\frac{272}{320}
$$

So:

$$
f\left(\frac{3}{40}\right) = -\frac{272}{320}
$$
$$
g\left(\frac{3}{40}\right) = \frac{9}{320}
$$

Since $-\frac{272}{320} \neq \frac{9}{320}$, $x=\frac{3}{40}$ is not an intersection point.

Conclusion: Neither $x=0$ nor $x=\frac{3}{40}$ satisfy $f(x) = g(x)$. The only solution is $x = \frac{8}{13}$.

Graphical Interpretation of the Functions and

Their Intersection

Understanding the intersection graphically provides valuable insight into the behavior of these lines.

Plotting $f(x) = 2x - 1$

- Passes through $(0, -1)$
- Slope of 2 indicates a steep ascent
- For easy visualization, plot points:
- At $x=0$, $f(0)=-1$
- At $x=1$, $f(1)=2(1)-1=1$
- At $x=-1$, $f(-1)=-2-1=-3$

Plotting $g(x) = \frac{3}{8}x$

- Passes through $(0,0)$
- Slope of $\frac{3}{8} \approx 0.375$, a gentle incline
- Plotting points:
- At $x=8$, $g(8)=3$
- At $x=-8$, $g(-8)=-3$

Intersection Point

- The lines cross at $x=\frac{8}{13} \approx 0.615$
- At this x, both functions yield the same y:

$$
f\left(\frac{8}{13}\right) = 2 \times \frac{8}{13} - 1 = \frac{16}{13} - 1 = \frac{16}{13} - \frac{13}{13} = \frac{3}{13}
$$

$$
g\left(\frac{8}{13}\right) = \frac{3}{8} \times \frac{8}{13} = \frac{3 \times 8}{8 \times 13} = \frac{3}{13}
$$

Confirmed: both functions intersect at $\left(\frac{8}{13}, \frac{3}{13}\right)$.

Deeper Analysis: Behavior of the Functions and Their Intersection

Nature of the Intersection

- Since both functions are linear with different slopes, they will intersect

at exactly one point unless they are coincident (which they are not).
- The intersection point is unique because the lines have different slopes, meaning they are not parallel.

Effect of Changing Parameters

- If the slopes or intercepts change, the intersection point will shift accordingly.
- For example, increasing the slope of \(g(x)\) will change the \(x\)-coordinate of intersection.

Significance of the Solutions

- The only real intersection point: \(\left(\frac{8}{13}, \frac{3}{13}\right)\).
- The points \(x=0\) and \(x=\frac{3}{40}\) do not satisfy the equality and are not points of intersection.

Implications in Applied Contexts

- Equating two functions models many real-world scenarios such as cost vs. revenue, supply vs. demand, or different rate comparisons.
- For instance, if \(f(x)\) and \(g(x)\) represent

Consider The Following Equations F X 2x 1g X 3 8xwhat Values Of X Will Result In F X G X 0 And 3 40

Consider The Following Equations F X 2x 1g X 3 8xwhat Values Of X Will Result In F X G X 0 And 3 40

Related Articles

- How Long Must A Driver Take To Drive The Last 50 Miles Of A 120 Mile Trip If He Wants To Average 50 Mph
- Gemini Auto Repair Is A Calendar Year Taxpayer. In 2019, The Repair Shop Purchased A Light Weight Truck
- If You Could Give Advice To Someone Who Isn't Feeling Well Physically Or Mentally What Advice Would You

Back to Home