Inverse Function Worksheet Questions and Answers PDF

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Part 1: Building a Foundation

What is the notation used to represent the inverse of a function $f(x)$?

Hint: Think about the common notation used in mathematics for inverse functions.

- ○ **A) $f^{-1}(x)$ ✓**
- ○ B) $\frac{1}{f(x)}$
- ○ C) $f(x)^{-1}$
- ○ D) $f^2(x)$

> The correct notation for the inverse of a function is $f^{-1}(x)$.

Which of the following statements are true about inverse functions?

Hint: Consider the properties and definitions of inverse functions.

- ☐ **A) An inverse function reverses the operation of the original function. ✓**
- ☐ B) The inverse of a function is always a function.
- ☐ **C) $f(f^{-1}(x)) = x$ for all x in the domain of f^{-1}. ✓**
- ☐ **D) The graph of an inverse function is a reflection over the line $y = x$. ✓**

> An inverse function reverses the operation of the original function, and the graph of an inverse function is a reflection over the line $y = x$.

Explain why a function must be one-to-one to have an inverse.

Hint: Consider the definition of one-to-one functions and their implications for inverses.

A function must be one-to-one to ensure that each output corresponds to exactly one input, allowing for a unique inverse.

List the steps involved in finding the inverse of a function.

Hint: Think about the algebraic manipulations needed to isolate the variable.

1. Step 1

Replace \(f(x) \) with \(y \).

2. Step 2

Swap \(x \) and \(y \).

3. Step 3

Solve for \(y \).

The steps typically include replacing \(f(x) \) with \(y \), swapping \(x \) and \(y \), and solving for \(y \).

Which test can be used to determine if a function is one-to-one?

Hint: Think about the graphical tests used in calculus.

- A) Vertical line test
- **B) Horizontal line test ✓**

◯ C) Diagonal line test
◯ D) Symmetry test

> The horizontal line test can be used to determine if a function is one-to-one.

Part 2: Comprehension and Application

If the function \(f(x) = 3x + 5 \), what is the first step in finding its inverse?

Hint: Consider how to manipulate the equation to isolate \(x \).

◯ A) Add 5 to both sides
◯ **B) Subtract 5 from both sides ✓**
◯ C) Divide by 3
◯ D) Multiply by 3

> The first step is to subtract 5 from both sides of the equation.

Which of the following are true about the domain and range of a function and its inverse?

Hint: Think about how the domain and range relate to each other.

☐ **A) The domain of the original function becomes the range of the inverse. ✓**
☐ **B) The range of the original function becomes the domain of the inverse. ✓**
☐ C) They remain unchanged.
☐ D) They are unrelated.

> The domain of the original function becomes the range of the inverse, and vice versa.

Describe how the graph of a function and its inverse are related.

Hint: Consider the geometric relationship between the two graphs.

The graph of a function and its inverse are reflections of each other across the line $y = x$.

Given the function $f(x) = 2x - 4$, what is the inverse function $f^{-1}(x)$?

Hint: Think about how to manipulate the equation to find the inverse.

- **A) $f^{-1}(x) = \frac{x + 4}{2}$ ✓**
- B) $f^{-1}(x) = \frac{x - 4}{2}$
- C) $f^{-1}(x) = 2x + 4$
- D) $f^{-1}(x) = 2x - 4$

The inverse function is $f^{-1}(x) = \frac{x + 4}{2}$.

Find the inverse of the function $f(x) = \frac{x - 1}{x + 1}$.

Hint: Consider how to manipulate the equation to isolate x.

To find the inverse, set $y = \frac{x - 1}{x + 1}$ and solve for x.

Part 3: Analysis, Evaluation, and Creation

Which of the following functions is not one-to-one and therefore does not have an inverse?

Hint: Consider the properties of the functions listed.

- A) $f(x) = x^3$
- B) $f(x) = \sqrt{x}$
- **C) $f(x) = x^2$ ✓**
- D) $f(x) = \ln(x)$

The function $f(x) = x^2$ is not one-to-one and does not have an inverse.

Analyzing the function \(f(x) = \frac{1}{x} \), which of the following statements are true?

Hint: Consider the properties of the function and its graph.

- [ ] **A) The function is one-to-one. ✓**
- [ ] **B) The function has an inverse. ✓**
- [ ] **C) The function's graph is symmetric about the line \(y = x \). ✓**
- [ ] **D) The function is not defined at \(x = 0 \). ✓**

> The function is one-to-one, has an inverse, and is symmetric about the line \(y = x \).

Analyze the function \(f(x) = |x| \) and explain why it does not have an inverse.

Hint: Consider the definition of one-to-one functions.

> **The function \(f(x) = |x| \) is not one-to-one because it maps both positive and negative values of \(x \) to the same output.**

If the function \(f(x) = 5x - 7 \) is modified to \(f(x) = 5x^2 - 7 \), what happens to its invertibility?

Hint: Consider how the modification affects the function's one-to-one property.

- ◯ A) It remains invertible.
- ◯ **B) It becomes non-invertible. ✓**
- ◯ C) It becomes invertible only for positive \(x \).
- ◯ D) It becomes invertible only for negative \(x \).

> The modified function \(f(x) = 5x^2 - 7 \) becomes non-invertible because it is not one-to-one.

Create a real-world scenario where finding the inverse of a function is necessary, and explain how you would solve it.

Hint: Think about situations where reversing a process is needed.

> **An example could be calculating the original price of an item after a discount, where the inverse function would help find the original price from the discounted price.**