Function Operations Worksheet

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Part 1: Building a Foundation

What is the notation for the addition of two functions \(f \) and \(g \)?

Hint: Think about how functions are combined.

- ◯ (f \cdot g)(x)
- ◯ (f+g)(x)
- ◯ (f-g)(x)
- ◯ \left(\frac{f}{g}\right)(x)

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Which of the following operations on functions are commutative?

Hint: Consider which operations can be performed in any order.

- ☐ Addition
- ☐ Subtraction
- ☐ Multiplication
- ☐ Division

Which of the following operations on functions are commutative?

Hint: Think about the properties of each operation.

- ☐ Addition

- ☐ Subtraction
- ☐ Multiplication
- ☐ Division

Explain the concept of function composition and provide an example using functions \(f(x) = 2x \) and \(g(x) = x + 3 \).

Hint: Think about how one function can be applied after another.

Explain the concept of function composition and provide an example using functions \(f(x) = 2x \) and \(g(x) = x + 3 \).

Hint: Consider how one function is applied after another.

List the conditions required for the existence of an inverse function.

Hint: Consider the properties that a function must have.

1. What is injectivity?

2. What is surjectivity?

3. What is bijectivity?

Part 2: Understanding and Interpretation

If \(f(x) = x^2 \) and \(g(x) = 3x \), what is \((f \circ g)(x) \)?

Hint: Apply the function \(g \) first, then apply \(f \).

- ◯ 3x^2
- ◯ 9x^2
- ◯ (3x)^2
- ◯ 6x

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- ◯ 9x^2
- ◯ (3x)^2
- ◯ 6x

Which of the following statements about function domains is true?

Hint: Consider how the operations affect the domains of the functions involved.

- ☐ The domain of \(f+g \) is the union of the domains of \(f \) and \(g \).
- ☐ The domain of \(f \cdot g \) is the intersection of the domains of \(f \) and \(g \).
- ☐ The domain of \(\left(\frac{f}{g}\right) \) excludes points where \(g(x) = 0 \).
- ☐ The domain of \(f \circ g \) is the domain of \(g \).

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Describe how the domain of a function is affected when two functions are composed. Use \(f(x) = \sqrt{x} \) and \(g(x) = x - 1 \) as examples.

Hint: Think about the restrictions imposed by each function.

Describe how the domain of a function is affected when two functions are composed. Use $f(x) = \sqrt{x}$ and $g(x) = x - 1$ as examples.

Hint: Think about the restrictions imposed by each function.

Part 3: Application and Analysis

Given $f(x) = x^2 + 1$ and $g(x) = x - 2$, find $(f-g)(3)$.

Hint: Calculate $f(3)$ and $g(3)$ first.

- ◯ 4
- ◯ 6
- ◯ 7
- ◯ 8

Given $f(x) = x^2 + 1$ and $g(x) = x - 2$, find $(f-g)(3)$.

Hint: Calculate $f(3)$ and $g(3)$ first.

- ◯ 4
- ◯ 6
- ◯ 7
- ◯ 8

If \(f(x) = 2x \) and \(g(x) = x^2 \), which of the following are true for \((f \cdot g)(x) \)?

Hint: Multiply the two functions together.

- [ ] 2x^3
- [ ] 2x^2
- [ ] 4x^3
- [ ] x^2 + 2x

If \(f(x) = 2x \) and \(g(x) = x^2 \), which of the following are true for \((f \cdot g)(x) \)?

Hint: Consider how to multiply the two functions.

- [ ] 2x^3
- [ ] 2x^2
- [ ] 4x^3
- [ ] x^2 + 2x

Calculate the domain of the function \(\left(\frac{f}{g}\right)(x) \) where \(f(x) = x^2 - 4 \) and \(g(x) = x - 2 \).

Hint: Consider where the denominator is zero.

Calculate the domain of the function \(\left(\frac{f}{g}\right)(x) \) where \(f(x) = x^2 - 4 \) and \(g(x) = x - 2 \).

Hint: Consider the restrictions imposed by the denominator.

Part 4: Evaluation and Creation

Analyze the functions $f(x) = x^2$ and $g(x) = \sqrt{x}$. Which statement is true about their composition $(f \circ g)(x)$?

Hint: Consider the domain of the inner function.

- ◯ It is defined for all real numbers.
- ◯ It is defined for $x \geq 0$.
- ◯ It is defined for $x > 0$.
- ◯ It is not defined.

Analyze the functions $f(x) = x^2$ and $g(x) = \sqrt{x}$. Which statement is true about their composition $(f \circ g)(x)$?

Hint: Consider the domains of both functions.

- ◯ It is defined for all real numbers.
- ◯ It is defined for $x \geq 0$.
- ◯ It is defined for $x > 0$.
- ◯ It is not defined.

Which of the following are true about the inverse of a function?

Hint: Consider the properties that define an inverse function.

- ☐ It reverses the effect of the original function.
- ☐ It always exists for any function.
- ☐ It is denoted by $f^{-1}(x)$.
- ☐ It requires the function to be bijective.

Which of the following are true about the inverse of a function?

Hint: Consider the properties of inverse functions.

- ☐ It reverses the effect of the original function.
- ☐ It always exists for any function.
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- ☐ It requires the function to be bijective.

Evaluate the statement: "The composition of two functions is always commutative."

Hint: Think about the order of function application.

- ◯ True
- ◯ False
- ◯ Not sure
- ◯ Depends on the functions

Which of the following are necessary steps to determine if two functions are inverses of each other?

Hint: Consider the conditions that must be satisfied.

- ☐ Check if \(f(g(x)) = x \) for all \(x \) in the domain of \(g \).
- ☐ Check if \(g(f(x)) = x \) for all \(x \) in the domain of \(f \).
- ☐ Verify that both functions are linear.
- ☐ Ensure both functions are bijective.

Which of the following are necessary steps to determine if two functions are inverses of each other?

Hint: Consider the properties that must hold for inverse functions.

- ☐ Check if \(f(g(x)) = x \) for all \(x \) in the domain of \(g \).
- ☐ Check if \(g(f(x)) = x \) for all \(x \) in the domain of \(f \).
- ☐ Verify that both functions are linear.
- ☐ Ensure both functions are bijective.

Create a real-world scenario where function composition would be useful. Describe the functions involved and how their composition solves the problem.

Hint: Think about a situation where one process depends on another.

Create a real-world scenario where function composition would be useful. Describe the functions involved and how their composition solves the problem.

Hint: Think about practical applications of functions.