Function Operations Worksheet Questions and Answers PDF

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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)

> The correct notation for the addition of two functions is \((f+g)(x) \).

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> The correct notation for the addition of two functions is \((f+g)(x) \).

Which of the following operations on functions are commutative?

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

- ☐ **Addition ✓**
- ☐ Subtraction
- ☐ **Multiplication ✓**
- ☐ Division

Addition and multiplication of functions are commutative operations.

Which of the following operations on functions are commutative?

Hint: Think about the properties of each operation.

- [ ] **Addition ✓**
- [ ] Subtraction
- [ ] **Multiplication ✓**
- [ ] Division

Addition and multiplication of functions are commutative operations.

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.

Function composition involves applying one function to the result of another. For example, \((f \circ g)(x) = f(g(x)) = 2(x + 3) = 2x + 6 \).

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.

> **Function composition involves applying one function to the result of another. For example, $(f \circ g)(x) = f(g(x)) = 2(x + 3) = 2x + 6$.**

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

Hint: Consider the properties that a function must have.

1. What is injectivity?

> A function is injectively if it maps distinct inputs to distinct outputs.

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2. What is surjectivity?

> A function is surjectively if every element in the codomain is mapped by some element in the domain.

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3. What is bijectivity?

> A function is bijective if it is both injectively and surjectively.

> A function must be bijective (both injectively and surjectively) to have an inverse.

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

> The composition \((f \circ g)(x) = f(g(x)) = f(3x) = (3x)^2 = 9x^2 \).

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

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- ◯ (3x)^2
- ◯ 6x

> The composition \((f \circ g)(x) = f(g(x)) = f(3x) = (3x)^2 = 9x^2 \).

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 \(g \).

> The domain of \(\left(\frac{f}{g}\right) \) excludes points where \(g(x) = 0 \).

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Hint: Consider how operations affect the domains of functions.

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- ☐ 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 \(g \).

> The domain of \(\left(\frac{f}{g}\right) \) excludes points where \(g(x) = 0 \).

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.

> **The domain of the composition $(f \circ g)(x)$ is determined by the domain of g and the values of $g(x)$ that are valid for f. For $f(x) = \sqrt{x}$ and $g(x) = x - 1$, the domain is $x \geq 1$.**

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.

> **The domain of the composite function is determined by the domain of the inner function and any restrictions from the outer 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

> The result of $(f-g)(3)$ is 6.

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

> The result of \((f-g)(3) \) is 6.

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

> The correct expression for \((f \cdot g)(x) \) is \(2x^3 \).

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

> The correct expression for \((f \cdot g)(x) \) is \(2x^3 \).

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.

The domain of \(\left(\frac{f}{g}\right)(x) \) is all real numbers except \(x = 2 \).

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.

The domain excludes the point where \(g(x) = 0 \), which is \(x = 2 \).

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.

The composition \((f \circ g)(x) \) is defined for \(x \geq 0 \).

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.

> The composition \((f \circ g)(x) \) is defined for \(x \geq 0 \).

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. ✓**

> The inverse of a function reverses its effect and 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.
- ☐ **It is denoted by \(f^{-1}(x) \). ✓**
- ☐ **It requires the function to be bijective. ✓**

> The inverse of a function reverses its effect and 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

> The statement is false; function composition is not commutative.

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. ✓**

> To determine if two functions are inverses, check if \(f(g(x)) = x \) and \(g(f(x)) = x \) for all \(x \) in their respective domains.

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. ✓**

> To verify if two functions are inverses, check if \(f(g(x)) = x \) and \(g(f(x)) = x \).

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.

> **An example could be calculating the total cost of an item after tax, where one function calculates the tax and another adds it to the original price.**

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.

> **An example could involve calculating total costs where one function represents the cost per item and another represents the number of items.**