Function Operations Worksheet Answer Key PDF

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Part 1: Building a Foundation

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

undefined. (f \cdot g)(x)

undefined. (f+g)(x) ✓

undefined. (f-g)(x)

undefined. \left(\frac{f}{g}\right)(x)

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

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Which of the following operations on functions are commutative?

undefined. Addition ✓

undefined. Subtraction

undefined. Multiplication ✓

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Addition and multiplication of functions are commutative operations.

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

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

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

1. What is injectivity?

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

2. What is surjectivity?

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

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 $(f \circ g)(x)$?

undefined. 3x^2

undefined. 9x^2 ✓

undefined. (3x)^2
undefined. 6x

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

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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?

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

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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.

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.

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 $(f-g)(3)$.

undefined. 4
undefined. 6 ✓
undefined. 7
undefined. 8

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

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

undefined. 4
undefined. 6 ✓
undefined. 7
undefined. 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 $(f \cdot g)(x)$?

undefined. 2x^3 ✓
undefined. 2x^2
undefined. 4x^3
undefined. 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 $(f \cdot g)(x)$?

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undefined. 2x^2
undefined. 4x^3
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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 $g(x) = x - 2$.

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 $g(x) = x - 2$.

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 $(f \circ g)(x)$?

undefined. It is defined for all real numbers.
undefined. It is defined for $x \geq 0$. ✓
undefined. It is defined for $x > 0$.
undefined. It is not defined.

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

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

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

undefined. It reverses the effect of the original function. ✓

undefined. It always exists for any function.

undefined. It is denoted by $f^{-1}(x)$. ✓

undefined. It requires the function to be bijective. ✓

The inverse of a function reverses its effect and requires the function to be bijective.

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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."

undefined. True

undefined. False ✓

undefined. Not sure

undefined. 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?

undefined. Check if $f(g(x)) = x$ for all x in the domain of g. ✓

undefined. Check if $g(f(x)) = x$ for all x in the domain of f. ✓

undefined. Verify that both functions are linear.

undefined. 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?

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undefined. Check if \(g(f(x)) = x \) for all \(x \) in the domain of \(f \). ✓

undefined. Verify that both functions are linear.

undefined. 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.

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.

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