

Composition Of Functions Worksheet With Answers

KEY

Name: _____ Date: _____ Period: _____

COMPOSITE FUNCTION WORKSHEET

Directions: Show all work for credit. Work must be neat and answer must be circled.

For 1-9: Let $f(x) = 2x - 1$, $g(x) = 3x$, and $h(x) = x^2 + 1$. Compute the following:

1. $f(g(-3))$

$$g(-3) = 3(-3) = -9$$

$$f(-9) = 2(-9) - 1 = \boxed{-19}$$

2. $f(h(7))$

$$h(7) = (7)^2 + 1 = 49 + 1 = 50$$

$$f(50) = 2(50) - 1 = \boxed{99}$$

3. $(g \circ h)(24)$

$$h(24) = (24)^2 + 1 = 576 + 1 = 577$$

$$g(577) = 3(577) = \boxed{1731}$$

4. $f(g(h(2)))$

$$h(2) = (2)^2 + 1 = 4 + 1 = 5$$

$$g(5) = 3(5) = 15$$

$$f(15) = 2(15) - 1 = \boxed{29}$$

5. $h(g(f(5)))$

$$f(5) = 2(5) - 1 = 10 - 1 = 9$$

$$g(9) = 3(9) = 27$$

$$h(27) = (27)^2 + 1 = 729 + 1 = \boxed{730}$$

6. $g(f(h(-6)))$

$$h(-6) = (-6)^2 + 1 = 36 + 1 = 37$$

$$f(37) = 2(37) - 1 = 74 - 1 = 73$$

$$g(73) = 3(73) = \boxed{219}$$

7. $f(x+1)$

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

$$= 2x + 2 - 1$$

$$= \boxed{2x + 1}$$

8. $g(3a)$

$$g(3a) = 3(3a)$$

$$= \boxed{9a}$$

9. $h(x-2)$

$$h(x-2) = (x-2)^2 + 1$$

$$= (x-2)(x-2) + 1$$

$$= x^2 - 2x - 2x + 4 + 1$$

$$= \boxed{x^2 - 4x + 5}$$

For 10-11: Let $f(x) = -3x + 7$ and $g(x) = 2x^2 - 8$. Compute the following:

10. $f(g(x))$

$$= -3(2x^2 - 8) + 7$$

$$= -6x^2 + 24 + 7$$

$$= \boxed{-6x^2 + 31}$$

11. $(g \circ f)(x)$

$$= 2(-3x+7)^2 - 8$$

$$= 2(-3x+7)(-3x+7) - 8$$

$$= 2(9x^2 - 21x - 21x + 49) - 8$$

$$= 2(9x^2 - 42x + 49) - 8$$

$$= 18x^2 - 84x + 98 - 8$$

$$= \boxed{18x^2 - 84x + 90}$$

12. If $f(x) = 3x - 5$ and $g(x) = x^2$, find $(f \circ g)(3)$

$$g(3) = (3)^2 = 9$$

$$f(9) = 3(9) - 5 = \boxed{22}$$

13. If $f(x) = -9x - 9$ and $g(x) = \sqrt{x-9}$, find $(f \circ g)(10)$

$$g(10) = \sqrt{10-9} = \sqrt{1} = 1$$

$$f(1) = -9(1) - 9 = -9 - 9 = \boxed{-18}$$

Composition of functions worksheet with answers is an essential educational tool designed to enhance students' understanding of the concept of function composition. This mathematical concept is fundamental in algebra and calculus, allowing students to explore how functions interact and combine. This article will delve into the importance of function composition, provide examples, and offer a comprehensive worksheet with answers to reinforce learning.

Understanding Function Composition

Function composition is the process of combining two functions to create a new function. If you have two functions, $f(x)$ and $g(x)$, the

composition of these functions is denoted as $(f \circ g)(x)$, which means $f(g(x))$. In simpler terms, you apply the function g first, followed by the function f .

Why is Function Composition Important?

Comprehending function composition is crucial for several reasons:

1. **Foundation for Advanced Topics:** Function composition lays the groundwork for more advanced mathematical concepts, such as calculus and differential equations.
2. **Real-World Applications:** Many real-world scenarios involve the composition of functions, such as in physics, economics, and engineering.
3. **Problem-Solving Skills:** Learning to compose functions helps students develop problem-solving skills and enhances their analytical thinking.

Components of a Composition of Functions Worksheet

A well-structured composition of functions worksheet typically includes several key components:

- **Definition Section:** A brief explanation of what function composition is.
- **Examples:** A variety of examples demonstrating how to compose functions.
- **Practice Problems:** A series of problems for students to solve, reinforcing the concept.
- **Answer Key:** Solutions to the practice problems for self-assessment.

Sample Problems for Practice

Here are a few sample problems that could be included in a composition of functions worksheet:

1. Given $f(x) = 2x + 3$ and $g(x) = x^2$, find $(f \circ g)(x)$.
2. If $f(x) = \sqrt{x}$ and $g(x) = 3x - 1$, calculate $(g \circ f)(x)$.
3. For $f(x) = x + 5$ and $g(x) = 2x$, determine $(f \circ g)(2)$.

Creating a Composition of Functions Worksheet

When creating your own composition of functions worksheet, consider the following steps:

Step 1: Define the Functions

Choose a set of functions that vary in complexity. For example:

- Linear functions: $f(x) = 3x + 2$, $g(x) = x - 4$
- Quadratic functions: $f(x) = x^2$, $g(x) = x + 1$
- Radical functions: $f(x) = \sqrt{x}$, $g(x) = 2x$

Step 2: Write Composition Problems

Formulate problems that ask students to find $(f \circ g)(x)$ and $(g \circ f)(x)$ for each pair of functions.

Step 3: Include Real-World Application Problems

To help students understand the practical application of function composition, include problems that relate to real-world scenarios. For instance:

- Problem: A car travels at a speed of $f(x) = 60x$ miles per hour for x hours. If the car stops for a break after traveling $g(x) = 2x$ hours, what is the total distance traveled?

Sample Composition of Functions Worksheet

Here is a simple worksheet you can use for practice:

Worksheet: Composition of Functions

1. Let $f(x) = x + 4$ and $g(x) = 3x - 2$. Calculate:

- (a) $(f \circ g)(x)$
- (b) $(g \circ f)(x)$

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

- (a) $(f \circ g)(x)$
- (b) $(g \circ f)(x)$

3. For $f(x) = \ln(x)$ and $g(x) = e^x$, evaluate:

- (a) $(f \circ g)(x)$
- (b) $(g \circ f)(x)$

Answer Key:

1.

- (a) $(f \circ g)(x) = 3x - 2 + 4 = 3x + 2$
- (b) $(g \circ f)(x) = 3(x + 4) - 2 = 3x + 12 - 2 = 3x + 10$

2.

- (a) $(f \circ g)(x) = 2(x + 1)^2 = 2(x^2 + 2x + 1) = 2x^2 + 4x + 2$
- (b) $(g \circ f)(x) = 2x^2 + 1$

3.

- (a) $(f \circ g)(x) = \ln(e^x) = x$
- (b) $(g \circ f)(x) = e^{\ln(x)} = x$

Conclusion

In summary, a composition of functions worksheet with answers serves as a valuable resource for students learning about function composition. By engaging with definitions, practicing problems, and exploring real-world applications, students can develop a solid grasp of this fundamental mathematical concept. Educators can utilize the examples and structure provided in this article to create effective worksheets that promote understanding and mastery of function composition.

Frequently Asked Questions

What is a composition of functions?

A composition of functions is a mathematical operation where one function is applied to the result of another function. It is denoted as $(f \circ g)(x) = f(g(x))$.

How do you solve a composition of functions problem?

To solve a composition of functions problem, first evaluate the inner function for a given input, and then substitute that result into the outer function.

What is the importance of the order of functions in composition?

The order of functions in composition is crucial because $(f \circ g)(x)$ is generally not the same as $(g \circ f)(x)$. The inner function is evaluated first, which can lead to different results depending on the order.

Can you provide an example of a composition of functions?

Sure! If $f(x) = 2x + 3$ and $g(x) = x^2$, then $(f \circ g)(x) = f(g(x)) = f(x^2) = 2(x^2) + 3 = 2x^2 + 3$.

Where can I find worksheets on composition of functions with answers?

You can find worksheets on composition of functions with answers on educational websites, math resource platforms, and teacher resource sites. Many offer printable worksheets and answer keys for practice.

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