ALGEBRA 2 – 4-3-14

Dear Algebra 2 Students:

Unfortunately, I am out sick today. Please work on these problems from sections 6.6. and 6.7. This is the rest of the material that will be on the test, which is tomorrow if I am here, and Wednesday next week if I am not here tomorrow.

Check the web site later for a practice test, which include problems from yesterday and today.

Please email me if you have any questions.

See you soon!
LW

Name_____ Class _____ Date_____

6-6 Reteaching

When you combine functions using addition, subtraction, multiplication, or division, the domain of the resulting function has to include the domains of both of the original functions.

Problem

Let $f(x) = x^2 - 4$ and $g(x) = \sqrt{x}$. What is the solution of each function operation? What is the domain of the result?

a. $(f + g)(x) = f(x) + g(x) = (x^2 - 4) + (\sqrt{x}) = x^2 + \sqrt{x} - 4$

b. $(f - g)(x) = f(x) - g(x) = (x^2 - 4) - (\sqrt{x}) = x^2 - \sqrt{x} - 4$

c. $(g - f)(x) = g(x) - f(x) = (\sqrt{x})(x^2 - 4) = -x^2 + \sqrt{x} + 4$

d. $(f \cdot g)(x) = f(x) \cdot g(x) = (x^2 - 4)(\sqrt{x}) = x^2\sqrt{x} - 4\sqrt{x}$

The domain of f is all real numbers. The domain of g is all $x \geq 0$. For parts a − d , there are no additional restrictions on the values for x, so the domain for each of these is $x \geq 0$.

e. $\frac{f}{g}(x) = \frac{f(x)}{g(x)} = \frac{x^2 - 4}{\sqrt{x}} = \frac{(x^2 - 4)\sqrt{x}}{x}$

As before, the domain is $x \geq 0$. But, because the denominator cannot be zero, eliminate any values of x for which $g(x) = 0$. The only value for which $\sqrt{x} = 0$ is $x = 0$. Therefore, the domain of $\frac{f}{g}$ is $x > 0$.

f. $\frac{g}{f}(x) = \frac{g(x)}{f(x)} = \frac{\sqrt{x}}{x^2 - 4}$

Similarly, begin with $x \geq 0$ and eliminate any values of x that make the denominator $f(x)$ zero: $x^2 - 4 = 0$ when $x = -2$ and $x = 2$. Therefore, the domain of $\frac{g}{f}$ is $x \geq 0$ combined with $x \neq -2$ and $x \neq 2$. In other words, the domain is $x \geq 0$ and $x \neq 2$, or all nonnegative numbers except 2.

Exercises

Let $f(x) = 4x - 3$ and $g(x) = x^2 + 2$. Perform each function operation and then find the domain of the result.

1. $(f + g)(x)$

2. $(f - g)(x)$

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

4. $(f \cdot g)(x)$

5. $\frac{f}{g}(x)$

6. $\frac{g}{f}(x)$

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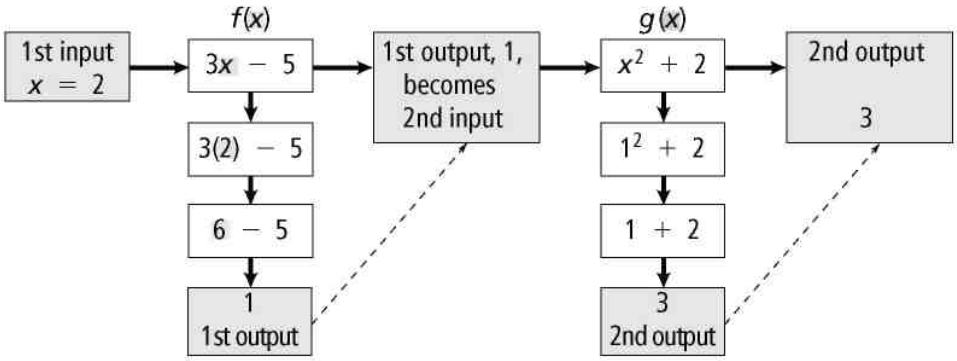
6-6 Reteaching (continued)

- One way to combine two functions is by forming a composite.
- A composite is written $(g \circ f)$ or $g(f(x))$. The two different functions are g and f.
- Evaluate the inner function $f(x)$ first.
- Use this value, the first output, as the input for the second function, $g(x)$.

Problem

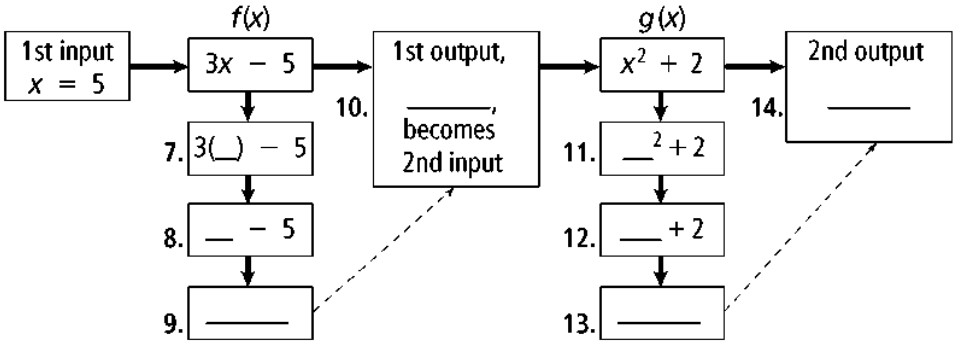
What is the value of the expression $g(f(2))$ given the inner function, $f(x) = 3x - 5$ and the outer function, $g(x) = x^2 + 2$?



Exercises

Evaluate the expression $g(f(5))$ using the same functions for g and f as in the Example. Fill in blanks 7–14 on the chart.

Use one color highlighter to highlight the first input. Use a second color to highlight the first output and the second input. Use a third color to highlight the second output, which is the answer.



Given $f(x) = x^2 + 4x$ and $g(x) = 2x + 3$, evaluate each expression.

15. $f(g(2))$ **16.** $g(f(2.5))$ **17.** $g(f(-5))$ **18.** $f(g(-5))$

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6-6 Practice

Form K

Let $f(x) = 4x + 8$ and $g(x) = 2x - 12$. Perform each function operation and then find the domain of the result.

1. $(f+g)(x)$

$f(x) + g(x)$

2. $(f-g)(x)$

3. $(f \cdot g)(x)$

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

Let $f(x) = x + 2$ and $g(x) = \sqrt{x} - 1$. Perform each function operation and then find the domain of the result.

5. $(f+g)(x)$

6. $(f \cdot g)(x)$

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

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

Let $f(x) = x - 2$ and $g(x) = x^2$. Find each value. To start, use the definition of composing functions to find a function rule.

9. $(g \circ f)(4)$

$f(4) = 4 - 2 = 2$

10. $(f \circ g)(-1)$

11. $(g \circ f)(-3)$

Let $f(x) = \sqrt{x}$ and $g(x) = (x + 2)^2$. Find each value.

12. $(f \circ g)(-5)$

13. $(f \circ g)(0)$

14. $(g \circ f)(4)$

6-6 Practice (continued) *Form K*

15. A car dealer offers a 15% discount of the list price x of any car on the lot. At the same time, the manufacturer offers a $1000 rebate for each purchase of a car.

a. Write a function $f(x)$ to represent the price after discount.

b. Write a function $g(x)$ to represent the price after the $1000 rebate.

c. Suppose the list price of a car is $18,000. Use a composite function to find the price of the car if the discount is applied before the rebate.

d. Suppose the list price of a car is $18,000. Use a composite function to find the price of the car if the discount is applied after the rebate.

e. Reasoning Between parts (c) and (d), will the dealer want to apply the discount before or after the rebate? Why?

16. Error Analysis $f(x) = 2\sqrt{x}$ and $g(x) = 3x - 6$. Your friend gives a domain for $\left(\frac{f}{g}\right)(x)$ as $x \geq 0$. Is this correct? If not, what is the correct domain?

Let $f(x) = 2x^2 - 3$ and $g(x) = \frac{x+1}{2}$. Find each value.

17. $f(g(2))$ **18.** $g(f(-3))$ **19.** $(f \circ f)(-1)$

20. Reasoning A local bookstore has a sale on all their paperbacks giving a 10% discount. You also received a coupon in the mail for $4 of your purchase. If you buy 2 paperbacks at $8 each, is it less expensive for you to apply the discount before the coupon or after the coupon? How much will you save?

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6-7 *Form K*

Find the inverse of each relation. Graph the given relation and its inverse.

1.

x	*y*
0	–1
1	1
2	3
3	5

2.

x	*y*
–2	7
0	3
2	7
4	19

3.

x	*y*
–3	2
–2	2
–1	2
0	2

Find the inverse of each function. Is the inverse a function? To start, switch *x* and *y*.

4. $y = \frac{x}{2}$

$x = \frac{y}{2}$

5. $y = x^2 + 4$

6. $y = (3x - 4)^2$

Graph each relation and its inverse.

7. $y = 3x - 4$

8. $y = -x^2$

9. $y = (3 - 2x)^2$

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6-7 Practice (continued) *Form K*

Find the inverse of each function. Is the inverse a function?

10. $f(x) = (x + 1)^2$ **11.** $f(x) = \frac{2x^3}{5}$ **12.** $f(x) = \sqrt{3x} + 4$

13. Multiple Choice What is the inverse of $y = 5x - 1$?

A $f^{-1}(x) = 5x + 1$ B $f^{-1}(x) = \frac{x+1}{5}$ C $f^{-1}(x) = \frac{x}{5} + 1$ D $f^{-1}(x) = \frac{x}{5} - 1$

For each function, find its inverse and the domain and range of the function and its inverse. Determine whether the inverse is a function.

14. $f(x) = \sqrt{x+1}$ **15.** $f(x) = 10 - 3x$ **16.** $f(x) = 4x^2 + 25$

17. The formula for the area of a circle is $A = \pi r^2$.

a. Find the inverse of the formula. Is the inverse a function?

b. Use the inverse to find the radius of a circle that has an area of 82 in.^{2}.

For Exercises 18 – 20, $f(x) = 5x + 11$. Find each value. To start, rewrite $f(x)$ as y and switch x and y.

18. $(f \circ f^{-1})(5)$ **19.** $(f^{-1} \circ f)(-3)$ **20.** $(f^{-1} \circ f)(0)$

$y = 5x + 11$