

1.6 **Function Operations and Compositions of Functions**

OBJECTIVES:

- Perform operations with functions
- Find compositions of functions

Operations with Functions

Let f and g be functions.

$$(f + g)(x) = f(x) + g(x)$$

$$(f \cdot g)(x) = f(x) \cdot g(x)$$

$$(f - g)(x) = f(x) - g(x)$$

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}; \text{ where } g(x) \neq 0$$

Given the following functions, find each function and its **domain**.

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

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

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

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

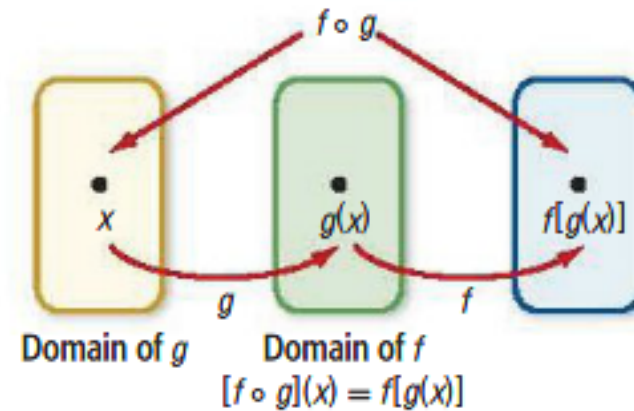
Composition of Functions

KeyConcept Composition of Functions

The composition of function f with function g is defined by

$$[f \circ g](x) = f[g(x)].$$

The domain of $f \circ g$ includes all x -values in the domain of g that map to $g(x)$ -values in the domain of f as shown.



Find each Composite function:

Ex. 1 $f(x)=x+7$ $g(x)=3+2x$

$(f \circ g)(x) = \underline{\hspace{2cm}}$ $(g \circ f)(x) = \underline{\hspace{2cm}}$

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Ex. 2 $f(x) = -4x^2$

$g(x) = x^2 - 1$

$(f \circ f)(x) = \underline{\hspace{2cm}}$

$(g \circ g)(x) = \underline{\hspace{2cm}}$

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Ex. 3

$$f(x) = x^2$$

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

$$(f \circ g)(x) = \underline{\hspace{2cm}}$$

$$(g \circ f)(x) = \underline{\hspace{2cm}}$$

Given:

$$f(x) = x^2 + 5 \quad g(x) = 9x - 1 \quad h(x) = -2x$$

Find:

1. $(f \circ g)(-2)$

2. $(h \circ g)(-3)$

3. $(f \circ (g \circ h))(2)$

Find the DOMAIN for the following:

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

Given: $f(x) = \frac{1}{x+4}$ and $g(x) = \frac{4}{x-3}$

Find the DOMAINS for the following:

$$f(g(x)), g(f(x)), f(f(x)), \text{ and } g(g(x))$$

Given: $f(x) = \frac{1}{x+3}$ and $g(x) = \frac{-2}{x}$

Decomposing a Function:

Express the given function as the composition of 2 functions.

Ex. 1 $h(x) = \sqrt{x^3 - 4}$

Ex. 2 $h(x) = 2x^2 + 20x + 50$

Application:

A computer store offers a 15% discount to college students on the purchase of any notebook computer. The store also advertises \$100 coupons.

- a. Find functions to model the data.
- b. Find the compositions of c and d and d and c .
What does each composite function mean?
- c. Which composition of the coupon and discount results in the lower price?

Assignment:

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