

6.3 Perform Function Operations and Composition

TEKS a.3, 2A.1.A



Before

You performed operations with algebraic expressions.

Now

You will perform operations with functions.

Why?

So you can model biological processes, as in Example 3.

Key Vocabulary

- power function
- composition

In Chapter 5 you learned how to add, subtract, multiply, and divide polynomial functions. These operations can be defined for any number of functions.

KEY CONCEPT

For Your Notebook

Operations on Functions

Let f and g be any two functions. A new function h can be defined by performing any of the four basic operations on f and g .

Operation	Definition	Example: $f(x) = 5x$, $g(x) = x + 2$
Addition	$h(x) = f(x) + g(x)$	$h(x) = 5x + (x + 2) = 6x + 2$
Subtraction	$h(x) = f(x) - g(x)$	$h(x) = 5x - (x + 2) = 4x - 2$
Multiplication	$h(x) = f(x) \cdot g(x)$	$h(x) = 5x(x + 2) = 5x^2 + 10x$
Division	$h(x) = \frac{f(x)}{g(x)}$	$h(x) = \frac{5x}{x + 2}$

The domain of h consists of the x -values that are in the domains of both f and g . Additionally, the domain of the quotient does not include x -values for which $g(x) = 0$.

POWER FUNCTIONS So far you have studied several types of functions, including linear functions, quadratic functions, and polynomial functions of higher degree. Another common type of function is a **power function**, which has the form $y = ax^b$ where a is a real number and b is a rational number.

EXAMPLE 1 Add and subtract functions

Let $f(x) = 4x^{1/2}$ and $g(x) = -9x^{1/2}$. Find the following.

- a. $f(x) + g(x)$ b. $f(x) - g(x)$ c. the domains of $f + g$ and $f - g$

Solution

a. $f(x) + g(x) = 4x^{1/2} + (-9x^{1/2}) = [4 + (-9)]x^{1/2} = -5x^{1/2}$

b. $f(x) - g(x) = 4x^{1/2} - (-9x^{1/2}) = [4 - (-9)]x^{1/2} = 13x^{1/2}$

- c. The functions f and g each have the same domain: all nonnegative real numbers. So, the domains of $f + g$ and $f - g$ also consist of all nonnegative real numbers.

REVIEW DOMAIN

For help with domains of functions, see p. 72.