1.8 Combinations of Functions: Composite Functions

Sum, Difference, Product, and Quotient of Functions

Let f and g be two functions with overlapping domains. Then, for all x common to both domains, the *sum*, *difference*, *product*, and *quotient* of f and g are defined as follows.

1. *Sum:* $(f + g)(x) = f(x) + g(x)$
2. *Difference:* $(f - g)(x) = f(x) - g(x)$
3. *Product:* $(fg)(x) = f(x) \cdot g(x)$
4. *Quotient:* $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \quad g(x) \neq 0$

When asked to find the domain of a composite function, as well as considering whether or not your solutions will work, you must consider the domain of both of the given functions. The domain of your composite function will be all real numbers shared in the domain of both given functions.

Examples: Find the following using the given functions.

1.) Given $f(x) =$ and $g(x) =$ find:

a.)

b.)

c.)

2.) Given $f(x) =$ and $g(x) =$ find each below and state the domain:

d.)

e.)

Definition of Composition of Two Functions

The **composition** of the function f with the function g is

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

The domain of $f \circ g$ is the set of all x in the domain of g such that $g(x)$ is in the domain of f. (See Figure 1.90.)

3.) Given $f(x) =$ and $g(x) =$ find:

f.)

g.)

h.)

4.) Given $f(x) =$ and $g(x) =$ find $(f \circ g)(x)$ and state it's domain.

5.) Write the function given by $h(x) =$ as a composition of 2 functions. There is more than one answer.