

MATH 156: Precalculus
Fall 2015
Worksheet §2.7: Combining Functions

By the end of this section, you want to know how to combine functions by addition, subtraction, multiplication, division, and composition. You want to know how to do this from the algebraically, graphically, and numerically. You should be able to find the domain of the new function. Finally, you also want to know how to “decompose” a function.

EXAMPLE 1 Use $f(x) = \sqrt{x^2 - 4}$ and $g(x) = \frac{x^2}{x+1}$ to write an expression for each new function and find its domain.

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

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

3. $(fg)(x)$

4. $(f/g)(x)$

EXAMPLE 2 For $f(x) = \frac{1}{x}$ and $g(x) = 3x - 1$ find the values below:

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

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

3. $(fg)(10)$

4. $(f/g)(-2)$

EXAMPLE 3 For each pair of function below find (a) $(f \circ g)(x)$, $(g \circ f)(x)$, $(f \circ f)(x)$, and $(g \circ g)(x)$.

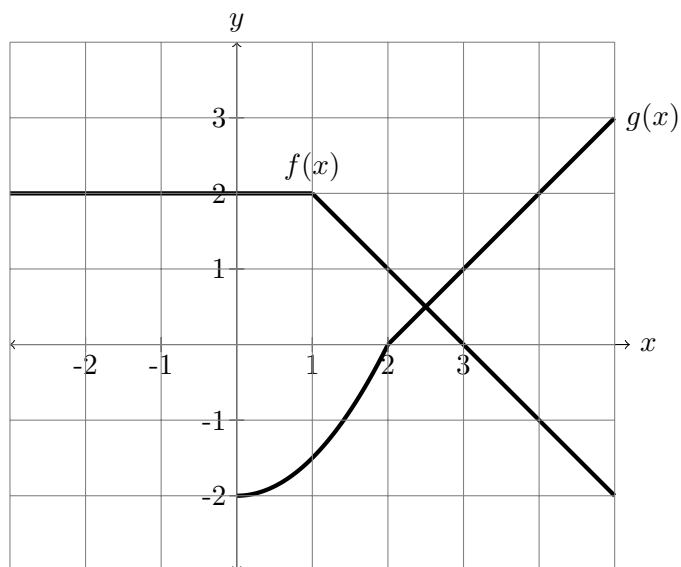
1. $f(x) = x^2 + 1$, $g(x) = 10 - x$

2. $f(x) = \frac{1}{x^2}$, $g(x) = x^3$

3. $f(x) = \sqrt[3]{5x+1}$, $g(x) = x + |2x|$

EXAMPLE 4 If $f(x) = 2x + 2$ and $g(x) = x^2$, find $(f \circ g)(10)$ and $(g \circ f)(10)$. Is the operation of composition commutative?

EXAMPLE 5 Use the graphs of $f(x)$ and $g(x)$ below evaluate the following expressions.



1. $(f + g)(4)$

2. $(fg)(0)$

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

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

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

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

7. $(f \circ f)(-1)$

8. $(f \circ f)(4)$

EXAMPLE 6 For each of the following, express the function as a composition of the form $f \circ g$ where $g(x) \neq x$.

1. $F(x) = 2\sqrt{4 + \sqrt{x}}$

2. $H(x) = \frac{1}{x^2+1}$

3. $G(x) = \frac{7x^3}{5+x^3}$