

2.7 – Combining Functions
2.8 – 1-to-1 Functions and their Inverses

Refer to [2.7 Notes and Videos](#) and [2.8 Notes and Videos](#) on [harryzaims.com](#). When you finish WebAssign for 2.7, you're ready for #s 1 – 5. When you've finished WebAssign for 2.8, you're ready for the rest.

1. (5 pts) From the graphs of f and g in the figure, find the following:

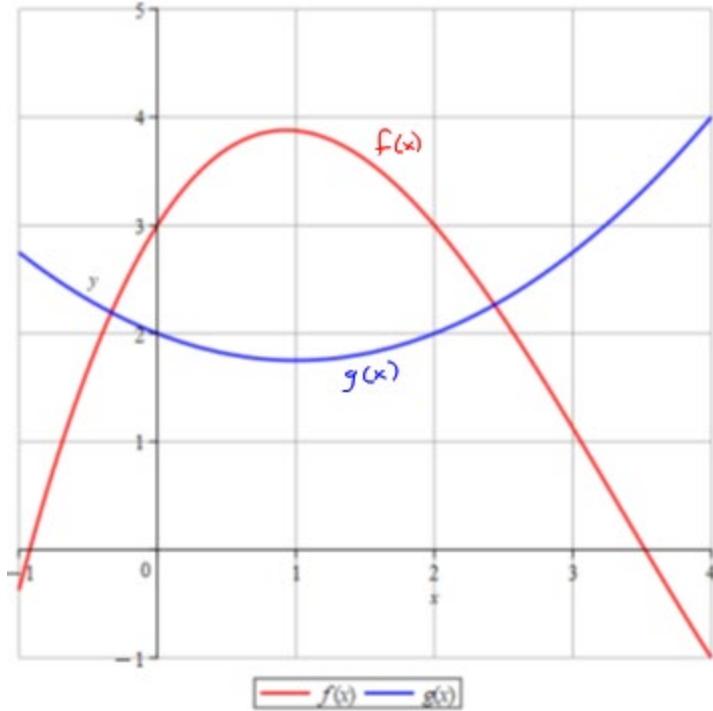
- $(f + g)(0)$
- $(f - g)(0)$
- $(fg)(0)$
- $\left(\frac{f}{g}\right)(0)$
- $(f \circ g)(0) = f(g(0))$

2. (5 pts) If $f(x)$ and $g(x)$ are real functions, what is the domain of $f \circ g$? If you can, write it as a set in set-builder notation:

$D(f \circ g) = \{x | x \text{ satisfies conditions}\}$. You need to supply the conditions on x .

3. Find the domain of each of the following:

- (5 pts) $f(x) = \sqrt{x} + \sqrt{49 - x^2}$
- (5 pts) $f(x) = \frac{\sqrt{x}}{\sqrt{49 - x^2}}$
- Find $f + g$, fg , f/g , and $f \circ g$ for $f(x) = \sqrt{x}$ and $g(x) = x^2 - 3x + 2$, Find the domain of each.
 - (5 pts) $f + g$
 - (5 pts) fg
 - (5 pts) f/g



d. (5 pts) $f \circ g$

5. (5 pts) Let $f(x) = \sqrt{x}$, $g(x) = \frac{x}{x-4}$, and $h(x) = \sqrt[6]{x}$. Find $f \circ g \circ h$.

Bonus (5 pts) What is the domain of your answer to #5?

6. (5 pts) Define what is meant by " f is a function" and define what is meant by " f is a 1-to-1 function."

7. (5 pts) If $f(x) = \frac{14}{x}$, what's $f^{-1}(2)$?

8. $f(x) = x^2 + 10x - 24$ has domain $D(f) = \{x \mid x \text{ is real}\} = (-\infty, \infty)$, because f is a polynomial. f is not 1-to-1, because $y_1 = f(-6) = f(-4) = y_2 = -48$, and the fact that $x_1 = -6 \neq -4 = x_2$. On [WebAssign](#), Section 2.8 #19 restricts the domain to $D = \{x \mid x \geq -5\} = [-5, \infty)$. (Your version of 2.8 #19 may vary.)

a. (5 pts) Show how making $D = [-5, \infty)$ fixes the 1-to-1 problem for f , by sketching the graph of f on its restricted domain. Label the left endpoint of the graph. Say a few words about how it passes the visual test for being 1-to-1. What's the *range* of this restricted version of f ?

b. (5 pts) Prove that f is not 1-to-1 algebraically. No, wait. I've already done that. I found two values of x that had the same $f(x)$ by going one step to the right and left of the x -value of its vertex, which, since I can complete the square, I know is $-b/2 = -10/2 = -5$, just by looking at the $+10x$ in the middle. In general, just solve the equation $f(x) = c$, for any c that will give you more than one solution. Typically, people will solve $f(x) = 0$, if they can, and it gives 2 solutions.

c. (5 pts) Find $f^{-1}(x)$. Sketch its graph. Label the lowest point on the graph. Then add a sketch of the line $y = x$ to the graph. Finally, add the sketch of f that you did in **part a** to the graph.

Bonus (5 pts) It's just as valid to restrict the domain to $D = (-\infty, -5]$. That would yield a different $f^{-1}(x)$. What would it be? Support your answer.

Bonus (5 pts) Sketch the graph of f , restricted to the domain from the previous bonus question. Sketch the graph of *its* inverse. Label the endpoint of each of the graphs. Also find and label the x - and y -intercepts of both. State the domain and range of each.

9. Let $f(x) = \frac{x-1}{x+4}$.

a. (5 pts) Find $f^{-1}(x)$.

b. (5 pts) State the domain and range of both f and f^{-1} . There's a trick that allows you to just find 2 domains for this question.