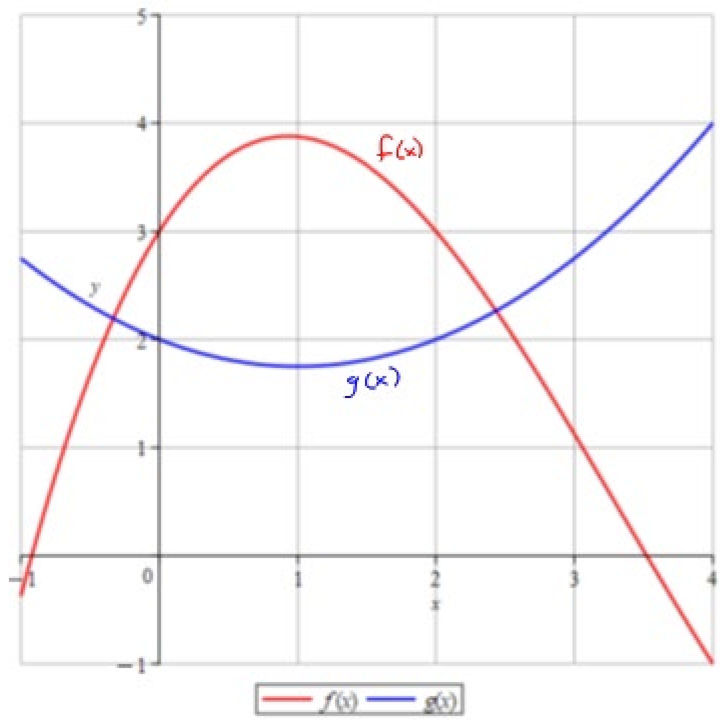
MAT 1340 Week 7 Written Assignment
70 points Covers Sections 2.7, 2.8

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 folloing:
   a. $(f+g)(0)$
   b. $(f-g)(0)$
   c. $(fg)(0)$
   d. $\left(\frac{f}{g}\right)(0)$
   e. $(f\circ g)(0)=f\left(g(0)\right)$

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:
   a. (5 pts) $f(x)=\sqrt{x}+\sqrt{49-x^2}$
   b. (5 pts) $f(x)=\dfrac{\sqrt{x}}{\sqrt{49-x^2}}$

4. Find $f+g$, fg, f/g, and $f \text{ o } g$ for $f(x)=\sqrt{x}$ and $g(x)=x^2-3x+2$, Find the domain of each.
   a. (5 pts) $f+g$
   b. (5 pts) fg
   c. (5 pts) f/g

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

5. (5 pts) Let $f(x) = \sqrt{x}, g(x) = \dfrac{x}{x-4}$, 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 $f(x) = \dfrac{14}{x}$, 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 +10*x* 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 $f(x) = \dfrac{x-1}{x+4}$.

   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.