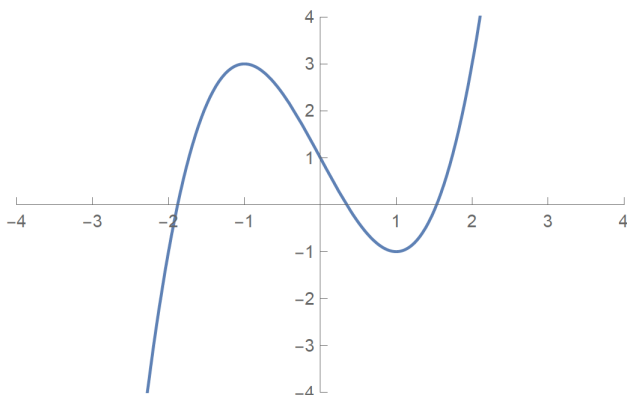
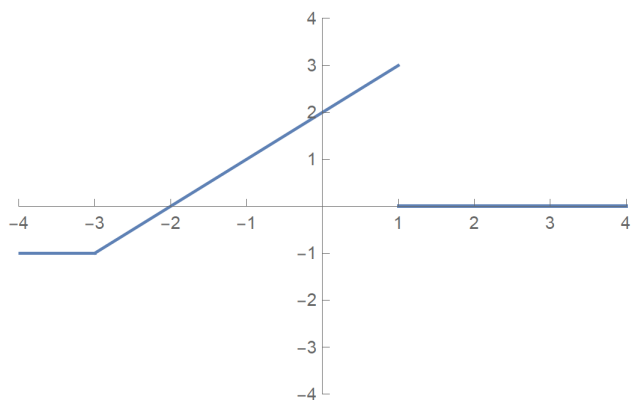


## Math 110 Review for Exam 1

1. The picture below displays the graph of a function  $f$ .



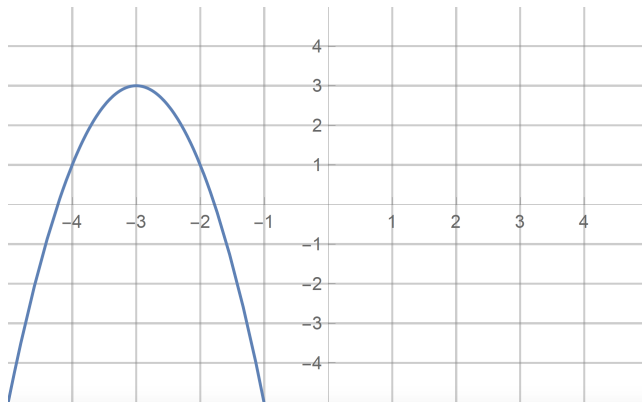
- What is the domain and range of  $f$ ? Use interval notation.
  - On which intervals of  $x$  is  $f$  increasing? Decreasing?
  - What are the local maximum and minimum values of  $f$ , and where do they occur?
2. The graph of a function  $g$  is displayed below.



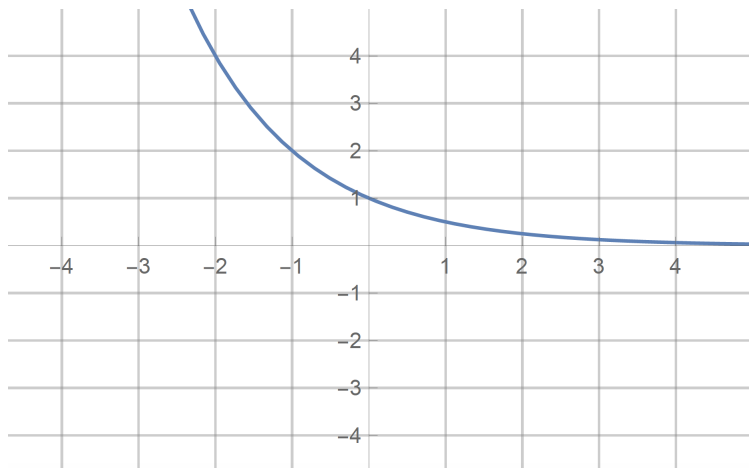
Write an explicit rule for  $g(x)$ , and test it with several values of  $x$ .

3. Let  $g(t) = \begin{cases} 3 - t^2 & : t < -1 \\ 2 & : t \geq -1 \end{cases}$ , and  $h(t) = \begin{cases} 3 & : t \leq 0 \\ t & : t > 0 \end{cases}$ .
- Sketch the graphs of  $h$  and  $g$ .
  - For what value(s) of  $t$  is  $h(t) = g(t)$ ? For what intervals of  $t$  is  $h(t) > g(t)$ ?
4. You are driving on the interstate at a constant speed. You notice you start at mile marker 210. After 1 and a half hours, you notice you pass mile marker 315. Since you are driving at a constant speed (hurray for cruise control), there is a linear relationship between the position you are on the road  $M$  (think mile markers) and the time  $t$  you have been driving on the interstate since passing that first mile marker you noticed.
- What is the slope between these points, and what is its meaning in this context?
  - Find a linear equation that models the position  $M$  (in miles) you are on the road in terms of the time  $t$  you have been driving.
  - How long will you have been driving when you reach mile marker 420?

5. The graph of a function  $f$  is displayed below.



- Using transformations, write down the explicit rule  $f(x)$  of the function.
  - Restrict the domain of  $f$  so that it has an inverse  $f^{-1}$ , and find a rule for  $f^{-1}(x)$ .
  - Use composition to check your answer in from part (b); verify that  $f \circ f^{-1}(x) = x$ .
6. Let  $f(x) = \frac{1}{x}$ ,  $g(x) = \frac{1}{x^2}$ ,  $h(x) = x - 3$ , and  $k(x) = \sqrt[3]{7 - 4x}$ .
- Find  $f(f(x))$  and its domain.
  - Find  $f(g(x))$  and its domain.
  - Find  $g(h(x))$  and its domain.
  - Find  $k^{-1}(x)$ .
7. Observe the following graph of a function  $f$ .



Is this function one-to-one? If so, sketch the graph of its inverse on the same coordinate plane.

The following problems are from written homework 4.

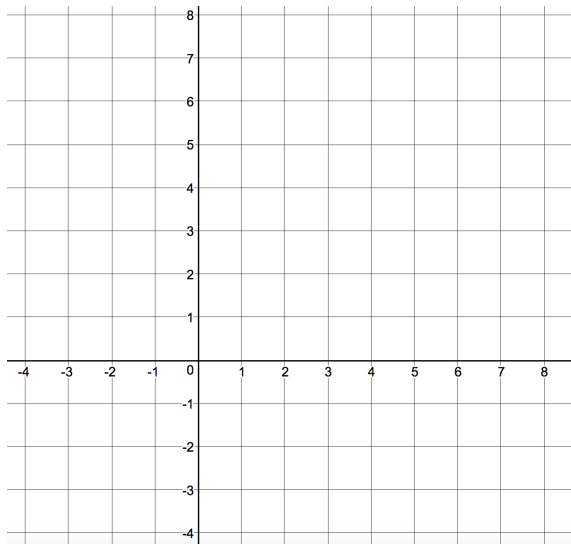
8. Given the quadratic function  $f(x) = -x^2 + 8x - 7$ , answer the following.
- Find the  $x$  and  $y$ -intercepts for  $f$ . Write your answers in point form.
  - Find the vertex of  $f$ , and write your answer in point form.
  - Does  $f$  have a minimum or maximum, and what is it?
  - Use your answers above to sketch a graph of  $f$ .
  - What is the domain and range of  $f$ ?
  - On what interval is  $f$  increasing, and on what interval is  $f$  decreasing?
  - On what interval is  $f(x) \geq 0$ ?

9. The number of apples produced by each tree in an apple orchard depends on how densely the trees are planted. If  $n$  trees are planted on an acre of land, then each tree produces  $900 - 9n$  apples. So the number of apples produced per acre is

$$A(n) = n(900 - 9n)$$

How many trees should be planted per acre to obtain the maximum yield of apples?

10. Given the function  $f(x) = 2 + \sqrt{x + 3}$ , answer the following.
- What is the domain and range of  $f$ ? Write your answers in interval form.
  - Sketch a graph of  $f$ .



- Find a formula for  $f^{-1}(x)$ . Note: Remember, the domain of  $f^{-1}(x)$  will match the range of  $f(x)$ .
  - Sketch a graph of  $f^{-1}(x)$ . Just sketch this above on part b's coordinate plane.
11. Sketch a graph of the following functions, using transformations of the given functions  $f(x) = x^2$ ,  $g(x) = \sqrt{x}$ , and  $h(x) = |x|$ , respectively. Please state what the transformations are and then graph them.
- $$F(x) = -2(x - 3)^2 \qquad G(x) = \sqrt{-\frac{1}{2}x} + 2 \qquad H(x) = 3 - |x + 1|$$
12. The discussion sheets from Thursday February 2nd (week 4) and from Tuesday February 7th (week 5) are excellent review as well, so be sure to look over those.