<u>Math 111 – Lab #3</u>   Name: _____

Please work together, however students must hand in their own lab. **Remember to show any work, NEATLY, and in PENCIL, please ☺, so to that end you may want to do your scratch work on a separate paper, transfer neat work to this, and staple your scratch to this. Make sure you number your scratch problems. Points are deducted for illegible work. (100 pts)**

1. 1. Below is the graph of $y = f(x)$.   Using transformations, graph the following functions. Think about moving the 4 critical points of the graph. Tic marks on each axis are 1 unit apart. Graph h on the left coordinate system and g and p on the right coordinate system; be sure to label your graphs. (12 pts)

$$h(x) = f(x - 2) + 1 \qquad\qquad\qquad g(x) = -f(x + 3) \qquad p(x) = 2f(x) - 5$$
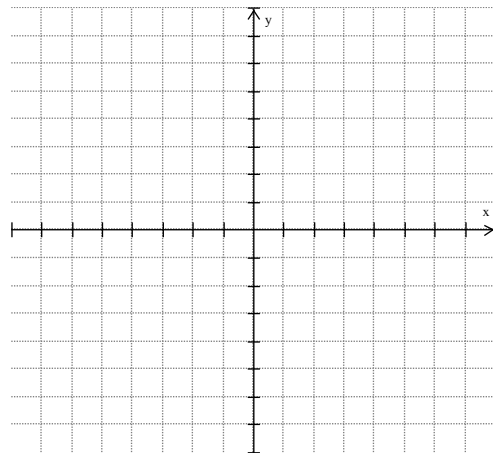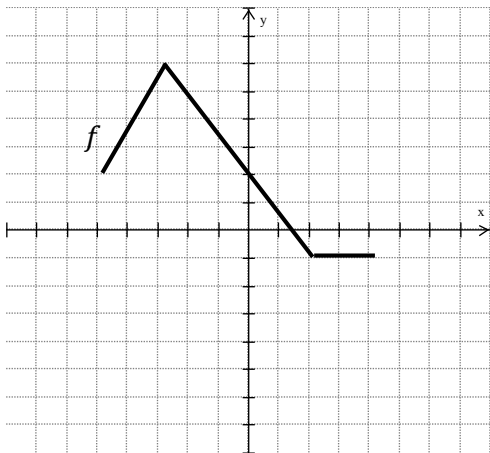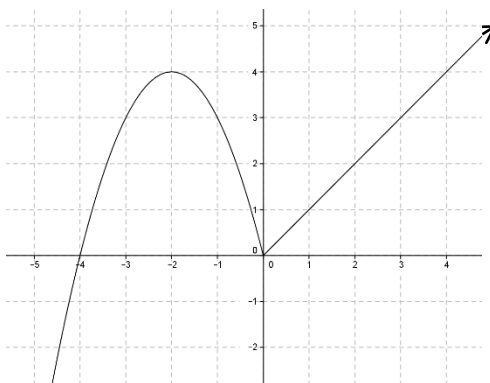
2. Describe using words how the graph of the function $g(x)$ is obtained from the graph of the function $f(x) = 2x^2$. (9 pts)

   a. $g(x) = 2(x - 4)^2$

   b. $g(x) = -2x^2$

   c. $g(x) = 6x^2$

3. The graph of $y = g(x)$ is shown below and let $f(x) = 2x + 3$.

   Use both to find the following. (9 pts)

   a. $1 + f(0) =$

   b. $(fg)(-2) =$

   c. $(g + f)(2) =$

4. Find the functions $f + g$, $f - g$, fg, and f/g and their domains for parts "a" and "b" (use either set or interval notation). **Simplify** if you are able. Leave no fractions within fractions.

   a. $f(x) = x^2 + 4x$ and $g(x) = x^2$ (12 pts)   <u>Domain:</u>
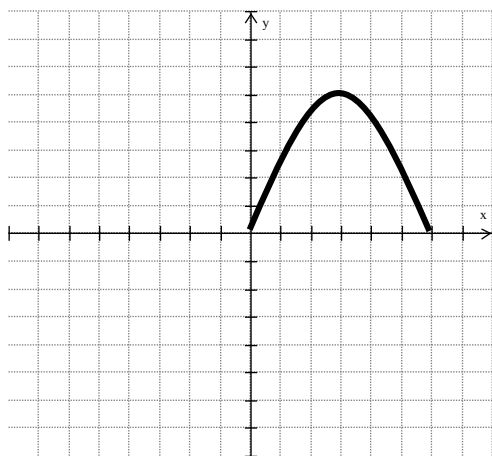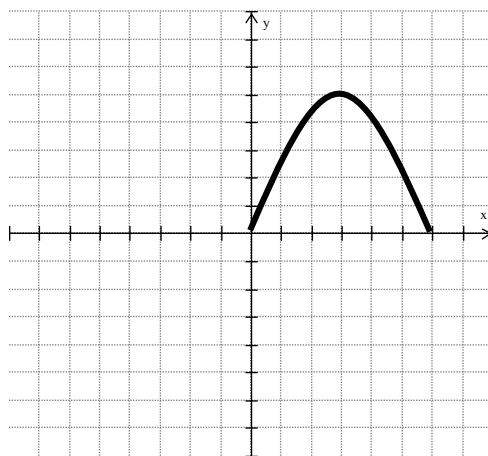
$(f + g)(x) =$

$(f - g)(x) =$

$(fg)(x) =$

$(f/g)(x) =$

   b. $f(x) = \dfrac{2}{x}$ and $g(x) = \dfrac{4}{x+4}$ (12 pts)

5. The graph of a function define for $x \geq 0$ is given. Complete the graph for $x < 0$ to make (a) an even function and (b) an odd function.

    Even function: (3 pts)   Odd Function: (3 pts)

Some review for the test!

6. Consider the function $f(x) = \sqrt{x+3}$ (6 pts)
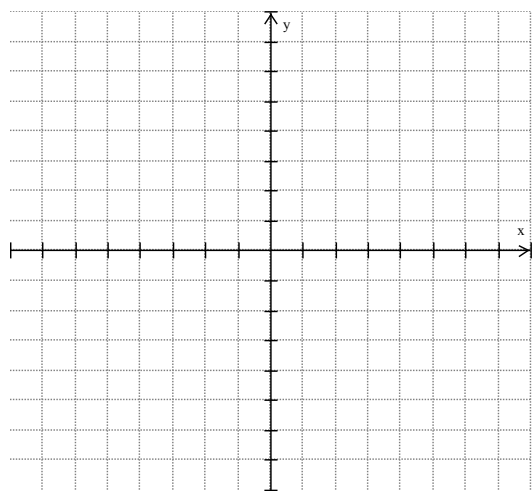
    a. Find $f(6) =$

                                         b. Find the value of x where $f(x) = 1$

    c. What is the domain of $f(x)$?

7. In your own words, define a function. (2 pt)

8. Consider the function $f(x) = x^3 + 3x^2 - 8x - 4$

    a. Use your calculator to graph $f(x)$ and then sketch it on the axes below. Remember to label your axes with a numerical scale. (2 pts)

    b. Give the ordered pairs that represent the locations of the local minima and maxima. Use your calculator's built-in function to find these, and round any decimals to 2 decimal places. (2 pts)

    c. On what interval(s) is $f(x)$ decreasing? (2 pts)

d. Find the average rate of change from $x = -1$ to $x = 2$. Show your work. (2 pts)

9. Below is the graph of piecewise function $h(x)$. Find a formula for $h(x)$. (4 pts)

$$h(x) = \begin{cases} \end{cases}$$
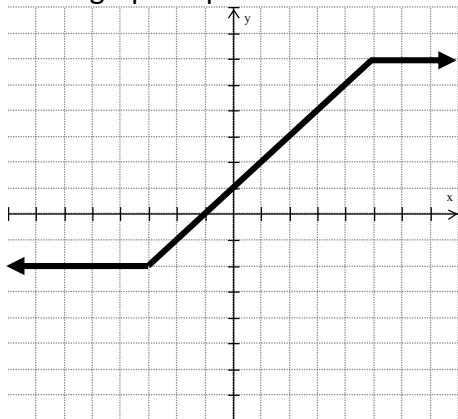
10. Given $f(x) = 2x + 2$ and $g(x) = x^3$ find the following functions and their domains. (6 pts)

a. $(fg)(x) =$
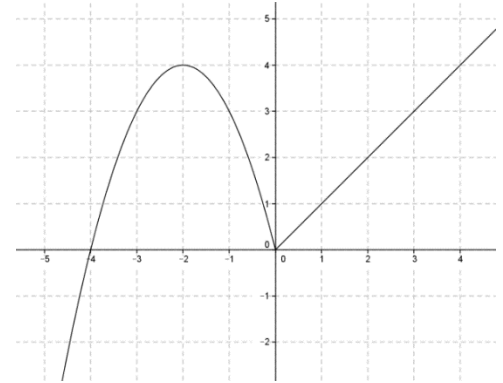
b. $f(g(x)) =$

c. $(g \circ f) =$

11. Let $f(x) = 2x + 3$, $k(x) = x^2 + 2x - 3$, and $y = g(x)$ is the shown graph.   Find the following. (8 pts)

a. $(f \circ k)(0) =$

c. $(f \circ g)(-1) =$

b. $g(g(-2)) =$

d. $k(g(0)) =$

12. Given the function in the form $H(x) = f(g(x))$ find $f(x)$ and $g(x)$ (2 pts)

$$H(x) = \sqrt{3 + \sqrt{x}}$$

13. An appliance dealer advertises a 10% discount on all his washing machines. In addition, the manufacturer offers a $100 rebate on the purchase. Let x represent the sticker price of the washing machine.

a. Suppose only the 10% discount applies. Find a function f that models the purchase price of the washer as a function of the sticker price x. (2 pt)

b. Suppose only the $100 rebate applies. Find a function g that models the purchase price of the washer as a function of the sticker price x. (2 pt)

c. Find $f(g(x))$. Use words to describe what this function represents. (Bonus 2 pts)

d. Find $g(f(x))$. Use words to describe what this function represents. (Bonus 2 pts)

e. Which option (question c or question d) is a better deal? (Bonus 1 pt)