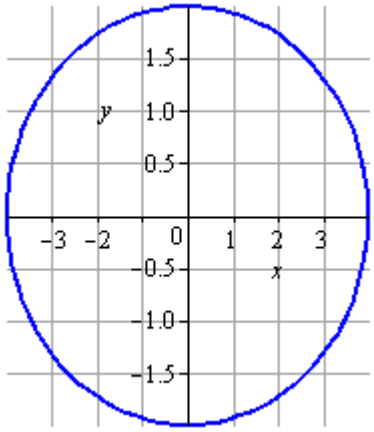
MAT 121, Spring, 2013 **Test 1**
100 Points Name_____

1. (5 pts) State whether the relation graphed below represents a function (Yes/No). If not, why not? What is the domain and what is the range of the relation?



2. (5 pts) Determine whether the equation $x^2 + 4y^2 = 16$ defines *y* as a function of *x*. If it does *not*, show/explain why not, either by a general argument, or by finding an *x*-value in the domain that corresponds to more than one *y*-value in the range.

3. Let $f(x) = x^2 - 6x + 8$ and $g(x) = \sqrt{3x - 6}$.

   a. Determine each of the following functions. Do not simplify.

      i. (5 pts) $(f + g)(x)$

      ii. (5 pts) $(f \cdot g)(x)$

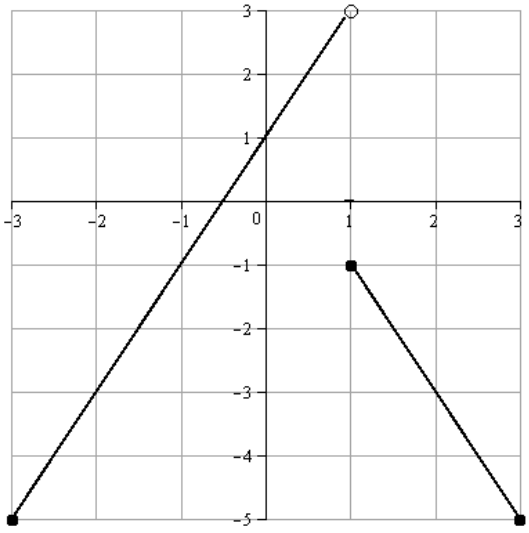
      iii. (5 pts) $\left(\frac{f}{g}\right)(x)$

   b. (5 pts) What is the domain of $\left(\frac{f}{g}\right)(x)$?

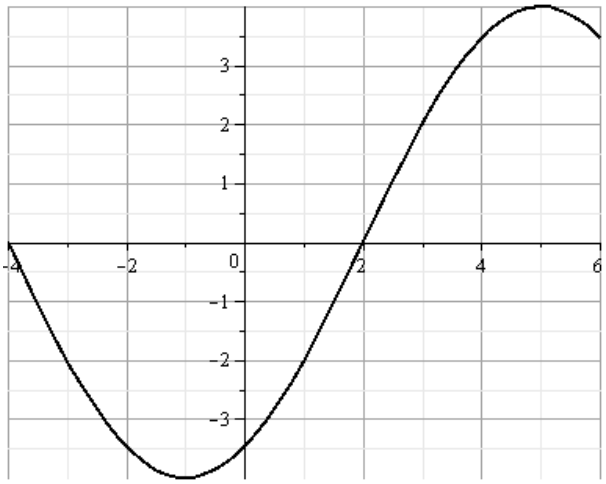
4. (5 pts) Let $f(x) = x^2 + 5$. Simplify the difference quotient $\dfrac{f(x+h) - f(x)}{h}$.

5. (5 pts) Find the average rate of change of f from $x = 2$ to $x = 3$. (Hint: Let $h = 1$ and use your work from the previous problem, for an appropriate choice of x.)

6. (5 pts) The graph of a piecewise-defined function is given. Write its definition.



7. Use the graph of the function *f*, below, to answer the following questions. Assume you're seeing the *entire* function, and don't worry about what it might be doing off the edges.



a. (5 pts) *x*-intercept(s):

b. (5 pts) *y*-intercept(s):

c. (5 pts) The domain and range:

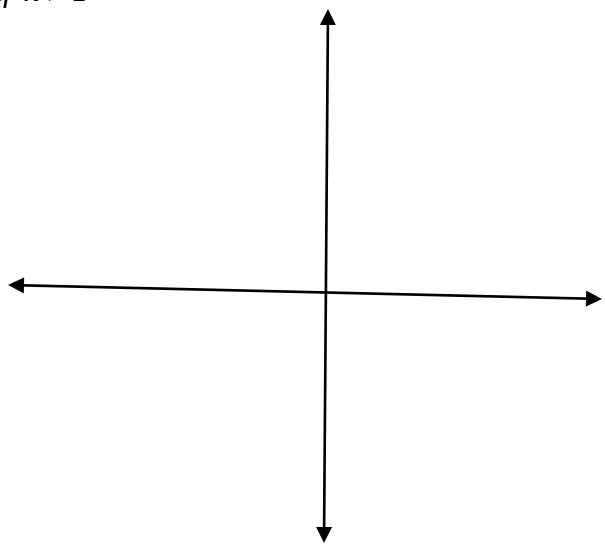
d. (5 pts) f has local minimum of _____ at _____.

e. (5 pts) f has a local maximum of _____ at _____.

f. (5 pts) f is increasing on _____.

g. (5 pts) f is decreasing on _____.

8. (6 pts) Sketch the graph of $f(x) = \begin{cases} 3x+9 & if\ -5 \le x < -1 \\ 1 & if\ x = -1 \\ -x & if\ x > 1 \end{cases}$. Show all intercepts.



9. Graph each of the following functions using the techniques of shifting, compressing, stretching, and/or reflecting. Start with the graph of the basic function and show all stages in separate sketches. Track 3 key points through the transformations, and show the *y*-intercept in the final sketch.

a. (7 pts) $g(x) = -2\sqrt{x-5} + 3$. (**2 pts bonus** – Show *x*-intercepts in final graph.)

b. (7 pts) $g(x) = (x+6)^2 - 4$ (**2 pts bonus** – Show *x*-intercept(s) in final graph.)