Math Xa Fall 2003
Lab 2: Functions
September 30, 2003

Name _____

Section Instructor _____

Collaborators _____

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You will need access to a graphing calculator to complete this lab. Make sure someone in your lab group has a graphing calculator. Also, all intervals you give as answers should be expressed in interval notation.

1. Let $f(x) = \sqrt{x^2 - 1}$.

   (a) Evaluate $f(2)$ by hand. Then use your calculator to evaluate $f(2)$. Do your answers agree?

   (b) Evaluate $f(\frac{5}{4})$ by hand. Then use your calculator to evaluate $f(\frac{5}{4})$. Do your answers agree?

   (c) Use your calculator to evaluate $f(\frac{1}{2})$. What does your calculator say when you do so? What does this mean?

   (d) What is the domain of f?

   (e) Assuming $t \geq -2$, find and simplify $f(\sqrt{t+2})$.

2. Let $f(x) = x^3 - 400x$.

   (a) Find the x-intercepts of f, if it has any, by hand.

   (b) Use your answer to part (a) to graph f on your calculator in a window that shows its important features. Write down the minimum and maximum x and y values of the window you choose here.

   (c) On what exact interval(s) is f positive? Use your graph to assist you in answering this question.

   (d) Use your calculator's trace feature to estimate the interval(s) on which f is increasing.

(e) Use your calculator's trace feature to estimate the interval(s) on which f is concave up.

3. Let $f(x) = \frac{1}{x-2}$.

   (a) Find the x-intercepts of f, if it has any, by hand.

   (b) Find the domain of f.

   (c) Use your calculator to find $f(1.9)$, $f(1.99)$, and $f(1.999)$. What appears to be happening to the values of $f(x)$ as x approaches 2 from the left?

   (d) Graph f on your calculator in a window that shows its important features. Write down the minimum and maximum x and y values of the window you choose here.

   (e) Is f continuous or discontinuous at $x = 2$? Explain your answer.

4. Let $f(x) = |2x - 1|$.

   (a) Find the x-intercepts of f, if it has any, by hand.

   (b) Graph f on your calculator in a window that shows its important features. Write down the minimum and maximum x and y values of the window you choose here.

   (c) Find by hand the interval(s) on which $f(x) > 2$. Check your answer using your calculator's trace feature.

5. Let $f(x) = x + 3$ and $g(x) = \dfrac{x^2 + 7x + 12}{x + 4}$.

   (a) Find the domains of f and g.

(b) Are f and g the same function? Why or why not?

(c) Is g continuous or discontinuous at $x = -4$? Explain your answer.

(d) Graph g on your calculator in a window that includes the point $(-4, -1)$. Does your calculator's graph convey your answer to part (c)? If so, describe how it does so.

6. Determine *algebraically* whether each of the following functions is even, odd, or neither.

(a) $f(x) = x + x^3 + x^5$

(b) $f(x) = x^2 + x^4$

(c) $f(x) = x + x^2$

(d) $f(x) = |x| + 4$