Math 220 AD9 Spring 2009 Worksheet 1

1. Describe in words what $|x-3| < 4$ means. Use this description to solve this inequality. Draw a picture displaying your answer. Now solve this using algebra. Do your answers agree?

2. Can you describe in words what $2 < |2x-1| < 6$ means? What should your picture look like this time? Does this agree with the answer you find using algebra?

3. Consider line $L_1 : 3x + 2y = 8$ and line $L_2 : 2x - 5y = 15$. Find the slope and y-intercept of each line. Are the lines increasing or decreasing? Using only the y-intercept and slope, graph each line on the same coordinate plane. Suppose these equations represented the relationship between two physical quantities. What does the slope tell you about that relationship?

   Can you find a line parallel to L_1 but whose graph is 5 units higher in the y-direction? 3 units lower?

   Can you find a line with the same y-intercept as L_2 but which is increasing three times as quickly?

4. In downtown Champaign, the intersection of Neil and University is at the origin $(0, 0)$. Then Walnut Street in downtown Champaign has equation $y = 4x - 3$. What direction does it (roughly) run in?

   Main Street intersects Neil two blocks due North of University. Main Street and Walnut Street are cross streets. What's the equation for Main Street?

5. Merc and Jeff have a frozen pie. They put it in the oven and bake it for an hour. They take it out and let it cool before they eat it. Later they put the leftovers in the fridge. Describe how the temperature of the pie changes as time passes. Sketch a rough graph of the temperature of the pie as a function of time.

6. Your group should come up with definitions/explanations for the following terms in your own words:

   function, domain, range.

7. What is the vertical line test and why does it work? Sketch an example of the graph of a function and also an example of a curve that is not the graph of a function.

8. Find the domain and range of the following functions:

   (a) $h(x) = \frac{x^2-4}{x-2}$

   (b) $f(x) = \sqrt{|x-1|-3}$

   (c) $g(x) = 2e^{\sqrt{x}}$

   (d) $x^3 + 7x^2 - 4$

9. Find an example of a function with domain:

   (a) the whole real line

   (b) the positive real numbers except 1 and 7

   (c) the positive numbers greater than 3 and the negative numbers less than -3

10. Write down what it means for a function to be one to one. How can you determine if a function is one to one by looking at its graph? Sketch a graph of a function which is not one to one.

11. Given the following graph of a function f, sketch a graph of its inverse function.

12. Determine whether the following functions have inverse functions, and find formulas for the inverses if they exist.

    (a) $g(x) = \frac{x}{2} + 37$.

    (b) $h(x) = x^2 - 9$

    (c) $f(x) = (x - 10)^3$

13. Look at all the formulas for functions on this worksheet. Which are polynomials? Which are rational functions? Which are neither?

14. Starting with a piece of wire 100 inches in length, you use x inches to make a circle and the remaining wire to make a square. Express the total area of the circle and the square as a function of x.

15. A rope is tied snugly around the equator of the earth. 20 metres of extra rope is now added to the old rope. The new rope is now held in a circular shape centred about the earth. Which of the following can now walk underneath the rope without touching it: an amoeba, an ant, or you?

Preparation for Next Time

Read sections 0.4 and 0.5.

Do Problem 3, Section 0.4, (p. 45) and Problem 8, Section 0.5, (p. 59).