MATH 29—OUTLINE FOR EXAM 1

Sections covered: Part of R.1, 1.1–1.8

Main ideas

A. Plotting points, distance, and midpoints

B. Circles and lines

C. Piecewise defined functions

D. Linear models (word problems)

E. Functions and relations: domain, range, intercepts

F. Analyzing functions: increasing/decreasing, relative maxima/minima

G. Transforming functions: translating, reflecting, shrinking/stretching

H. Combining functions: addition, subtraction, multiplication, division, composition

Skills you should have

1. Be able to plot points, find distance between two points, and find the midpoint of the segment joining two points.

2. Be able to work with and graph circles.

   - Be able to graph a circle given the equation.
   - Be able to write an equation for a circle given the center and radius.
   - Be able to write an equation for a circle given other information, such as the center and a point on the circle, or two points on a diameter.

3. Be able to work with and graph lines.

   - Be able to graph a line given the equation.
   - Be able to write an equation for a line given the slope and a point on the line.
   - Be able to write an equation for a line given other information, such as two points on the line.
   - Given a line L, be able to find the slope of a line parallel or perpendicular to L.

4. Be able to work with and graph piecewise defined functions.

5. Be able to build and analyze a linear model in the context of a word problem (see the "drought problem" from class).

   - Given information about a quantity that is modeled by a linear function, be able to write an equation for the function.
   - Be able to use the equation you found, to answer questions about the function.

6. Be able to analyze the *graph* of a function or relation.

   - Be able to find the domain and range and write them in interval notation.

- Be able to find the x and y-intercepts.
- Be able to determine if it is symmetric about the x-axis, y-axis, or origin.
- Be able to determine if a relation defines y as a *function* of x (Vertical Line Test).
- For a function, be able to find intervals of increasing/decreasing and locate relative maximum and minimum values.

7. Be able to analyze the *equation* of a function or relation.

- Be able to find the domain and x and y-intercepts;
- Be able to determine if it is symmetric about the x-axis, y-axis, or origin.
- Be able to draw the graph by plotting points.
- For a function, be able to determine if it is even or odd (or neither).

8. Be able to work with transformations of graphs: vertical and horizontal translations, reflections, stretches (and shrinks)

- Know how to perform the transformations graphically and algebraically.
- Be able to graph a complex equation (like $y = 2(x-3)^2 - 5$) by applying transformations to a basic graph (like $y = x^2$).
- Be able write an equation for a graph by transforming the equation for a basic graph.

9. Be able to combine functions algebraically to get new functions (using addition, subtraction, multiplication, division and composition).

- Be able to find the domain of the new function.
- Focus on finding the composition of functions and the domain of the result.

10. Be able to compute the average rate of change of a function over an interval.

11. Be able to compute the difference quotient for a function.

How to study

I. Review core topics

II. Work *lots* of problems all of the way through—focus on ALEKS problems, problems from class, and problems from the book. For example, you could work problems from the Chapter 1 Review Exercises at the end of Chapter 1 in our book.

III. Practice doing several problems in a short amount of time (by timing yourself)

IV. Come talk with me if you have any questions!