Review for Exam 1

What follows is intended as a guide to focus your study for Exam 1. Read the Overview and the Study Tips. After that there is list, arranged by section, of the ideas and techniques that you must know for the exam.

Overview

- Expect to see somewhere from 12 to 15 problems that look very much like homework problems.
- About 50% to 60% of the exam will be problems that should remind you of the easy to moderate homework problems.
- Another 30% to 40% will look like the more involved homework problems.
- The last 10% will be a new problem that requires an original application of the ideas and/or techniques of Chapters 1 and 2.
- VERY IMPORTANT NOTE: Many of the Chapter 1 topics listed below are algebraic manipulations that you end up having to do as part of Chapter 2 problems. Few of them are decent stand-alone test problems, so most of the exam will look like Chapter 2 problems.

Study Tips

- Do lots of homework!
- You goal should be to do so much homework that you can look at a problem and immediately know what to do with it.
- Once you know what to do, you should be able to do it quickly.
- The only way to get to this point is to work a large number of homework problems. If you feel that I did not assign enough, work some more. Look for unassigned problems that are similar to the assigned ones. If you need more, do even ones. If you need more than that, go to the review problems at the end of each chapter.

Section 1.1

- Nothing here is testable, but these ideas can come up in other problems.

Section 1.2

- Know all the laws of exponents. Be able to manipulate them quickly and accurately.
- Know how to convert radicals to exponents.
Section 1.3
- Know how to add and multiply algebraic expressions.
- Be able to factor anything that has:
  1. An obvious common factor.
  2. A difference of squares.
  3. A simple quadratic structure.
- WARNING: Be sure you can do this for quantities in parentheses just as for a single letter.

Section 1.4
- Know how to add and subtract algebraic fractions.
- Know that this requires a common denominator.
- Know how to multiply and divide algebraic fractions.
- Know how to simplify a fraction by factoring and canceling.
- Know that you CANNOT cancel without completely factoring.
- Be able to simplify compound fractions.

Section 1.5
- Be able to solve any linear equation.
- Be able to solve any quadratic equation. You may use any methods other than calculator solutions.
- Be able to solve equations involving algebraic fractions.
- Be able to solve equations involving radicals.
- Be able to solve equations that have the pattern of a quadratic. For example, Hw. 1.5.50.
- Be able to solve for a specified variable in an equation with more than one variable.

Section 1.6
- Know how to solve the word problems in this section.
- NEVER USE AN UNDEFINED VARIABLE.
- ALWAYS INCLUDE UNITS IN YOUR ANSWER.

Section 1.7
- Know how to solve any linear inequality.
- Be able to recognize when an inequality is NOT linear.
- Know how to solve non-linear inequalities.
Section 1.8

- Know how to find and plot points.
- Know how to sketch regions described by inequalities.
- Be able to find the equation of a circle given data about radius, center, points on the circle, etc.

Section 1.10

- Be able to find the equation of a line given a point and some information that leads to the slope of the line.

Sections 2.1 and 2.2

- Know that a function is
  1. A set of inputs (the domain.)
  2. A rule for generating outputs.
- Know how to evaluate a function given a formula, a graph, or a table of values.
- Be able to compute the output of a function for numerical or symbolic input, no matter how messy the input.
- Know how to find the domain of a function given by a formula, a graph, or a table of values.
- Given a description of a function, be able to sketch a realistic and reasonable graph of the function.

Section 2.3

- Know how to translate “proportional to” and “varies with”.
- Be able to solve variational word problems.
- **UNITS ARE REQUIRED!**

Section 2.4

- Be able to compute the average rate of change of a function.
- Be able to tell where a function is increasing and where it is decreasing.

Section 2.5

- Given a graph of a function \( f(x) \) and a number \( a \), be able to find the graph and domain of \( f(x) + a \), \( af(x) \), \( f(x + a) \), \( f(ax) \), and any combination of these transformations.
• Conversely, given a graph of a transformed function, be able to write a formula for it.

• Given a transformed function. (I.e., some combination of \( f(x) + a, af(x), f(x + a), f(ax) \), be able to write a sentence describing the transformation.

• Conversely, given a description of a transformation, be able to write the formula for the transformed function.

Section 2.6

• Know how to complete the square to put a quadratic in standard form.

• Be able to find the vertex of a parabola.

• Be able to use this information to answer questions about the maximum or minimum value of a function.

Section 2.7

• Know how to solve the word problems in this section.

• NEVER USE AN UNDEFINED VARIABLE.

• ALWAYS INCLUDE UNITS IN YOUR ANSWER.

Section 2.8

• Given functions \( f \) and \( g \), be able to evaluate, graph, and/or find the domain of \( f + g, f - g, fg, f/g \), and any other algebraic combination of these.

• Be able to do this if the functions are given as formulas, graphs, or tables.

• Be able to evaluate, graph, and/or find the domain of the composition of two functions.

• Be able to do this if the functions are given as formulas, graphs, or tables.

Section 2.9

• Be able to determine if a function is one-to-one.

• Be able to do this if the function is given by a formula, a graph, or a table of values.

• Know the basic rule that relates a function and its inverse:

\[
f(x) = y \iff f^{-1}(y) = x
\]

• Know that this means “Inputs and outputs trade places.”

• Given a function \( f \) (either by formula, graph, or table) be able to compute \( f^{-1} \) of a single input.

• Given a function described by a formula, be able to construct a formula for \( f^{-1} \).

• Given a graph of a function, be able to graph the inverse function.