Review sheet for exam 1

The best way to study for the exam is to learn how to do all of the assigned practice problems. If you run out of problems, learn to do all of the problems in the book!

Here are some problems from the chapter review sections that you should try:

- Chapter 1 Review: Concept check, true–false quiz, 1-16, 18, 19, 23, 24, 25a, 25b, 26
- Chapter 2 Review: Concept check, true–false quiz, 1-20, 23, 24, 29, 30, 33-34, 35, 36, 37, 42-44

The following is a list of the topics that I think are important:

- Basic *Mathematica*
  - You may use the reference guide that I distributed in class. If you have written on your reference guide, you may use a loaner.
  - Know the basics of using *Mathematica*as a calculator (including how to get a decimal approximation to an input).
  - Be able to define and work with functions in *Mathematica*.
  - Know the difference between the three types of brackets.
  - Know how to use Plot, Manipulate, Limit, and ListPlot.
- 1.1 What is a function?
  - Know the definition of a function and its domain, range and graph.
  - Be comfortable working with piecewise defined functions and functions defined by tables
- 1.2 A catalog of functions
  - Know the graphs and definitions of all basic functions discussed in class.
- 1.3 New functions from old
  - Understand how graph transformations work (shifts/stretches).
  - Understand all the ways discussed to combine two functions to get a new function and how to find their domains.
- 1.5 Exponential functions
  - Know the laws for how exponential functions behave.

  - Know the graphs of exponential functions
  - Know how to solve equations involving exponential functions.

- 1.6 Inverse functions and logarithms
  - Know the definition of inverse functions and one–to–one functions.
  - Know how to compute inverses.
  - Know the definition of $\log_a$.
  - Know the laws for how logarithmic functions behave.
  - Know the graphs of logarithmic functions.
  - Know how to solve equations involving logarithms.

- 2.1 Tangents and velocities.
  - Know what a secant line is and how to compute it given data about a function.
  - Understand the connection between slope of secant lines and average velocity.

- 2.2 Limits
  - Understand the definition of the limit of a function at a point.
  - Understand how to interpret the definition both graphically and numerically.
  - Know the definitions of 1–sided limits and their relationship with 2–sided limits.
  - Know what it means for a function to have an infinite limit and the connection with vertical asymptotes.

- 2.3 Calculating limits with the limit laws
  - Know the limit laws and how to use them to manipulate limits.
  - Be able to compute limits (knowing how to do every problem in 2.3: 11-30 is a start)
  - Know the statement of the squeeze theorem and be able to use it.

- 2.5 Continuity
  - Know the definition of continuity and 1–sided continuity.

- Be able to identify the different types of discontinuity (removable, jump, infinite).
- Know the statement of the intermediate value property and be able to apply it to solving problems.
- Be able to use continuity to evaluate limits.
- Know which functions are continuous.

- 2.6 Limits at infinity
  - Understand the meaning of limits at infinity and the definition of a horizontal asymptote.
  - Know the techniques for computing limits at infinity.

- 2.7 Definition of the derivative
  - The definition
$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$
  - The definition
$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$
  - The slope of the tangent line at $x = a$ to the graph of $y = f(x)$ is given by $f'(a)$.
  - Be able to compute derivatives using either definition.

- 2.8 The derivative as a function
  - The definition
$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$
  - Be able to sketch the graph of the derivative given the graph of a function.
  - Know how to detect where a function is not differentiable.
  - Higher derivatives
  - Be able to compute derivatives using the definition.
  - Know how to find an equation for the tangent line to a curve at a given point.