Calculus 1 — Outline for Exam 1

Main ideas

A. Limits (one-sided, two-sided, and at infinity) and connection to asymptotes

B. Continuity

C. Definition of tangent lines, velocity, and the derivative

Skills you should have

1. Be able to compute limits and determine is a function is continuous *from a graph*.

2. Be able to compute limits and determine is a function is continuous *numerically* (by plugging numbers into a function and studying the outputs).

3. Be able to compute limits and determine is a function is continuous *algebraically*.

- Be able to "simplify" limits if direct substitution yields something indeterminate. Remember that the techniques to "simplify" are different if you are computing a limit as $x \to a$ versus $x \to \infty$.
- Be able to work with piece-wise defined functions.

4. Be able to determine the vertical and horizontal asymptotes of a function.

5. Be able to state the definition of a function being continuous at a, which is that (1) $f(a)$ exists, (2) $\lim_{x \to a} f(x)$ exists, and (3) $\lim_{x \to a} f(x) = f(a)$.

6. Be able to compute derivatives, slopes of tangent lines, and velocities using the definition of the derivative; that is, using
$$\lim_{h \to 0} \frac{f(a+h) - f(a)}{h}.$$
Also know how to write out an equation of the tangent line after you have found the slope, for example by using point-slope form.

How to study

I. Review core topics

II. Work *lots* of problems all of the way through—focus on WebAssign problems and Worksheet problems

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

IV. Come talk with me if you have any questions