Math 130-04, Fall 2010 — First Test Info

The first test for this course will be given in class on Friday, September 24. The test will concentrate on Chapter 2, Sections 1 through 5. You should be familiar with the precise definition of the limit from Chapter 2, Section 7, but there will not be any problems on the test that ask you to calculate limits using that definition or to find a δ for a given ϵ. The test will also cover selected topics from Chapter 1; see the list below.

The test will include some "short essay" questions that ask you to define something, or discuss something, or explain something, and so on. Other than that, you can expect most of the questions to be similar to the types of problems that were assigned for homework.

You will not need a calculator for the test. *A basic non-graphing calculator will be provided to you, and you will be permitted to use only the calculator that is provided. Scrap paper will also be provided. All you need is a pencil.*

In addition to my usual office hours this week, I will be available in my office on Thursday from 10:00 to 11:00 AM and from 1:30 to 4:00 PM.

Here are some terms and ideas that you should be familiar with for the test:

intervals of real numbers; open and closed intervals; the number line

function

domain of a function

natural domain of a function that is defined by a formula

the graph of a function; reading the value of a function from a graph

"split" functions that are defined by several different formulas

composition of functions, $f \circ g$

absolute value

definition of absolute value as a split function, $|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$

$|a - b|$ is the distance between a and b

inverse functions

$\log_b(x)$ and b^x as inverse functions ($\log_b(b^x) = x$, and $b^{\log_b(x)} = x$)

radians

definitions of $\sin(x)$ and $\cos(x)$ using the unit circle

the identity $\sin^2(x) + \cos^2(x) = 1$, and how it relates to the unit circle

average velocity on an interval, defined as change in position divided by change in time

the ideal of "instantaneous velocity," and the problem with computing it directly

average velocity on a small interval as an approximation for instantaneous velocity instantaneous velocity as a "limit" of average velocities

secant lines and tangent lines

slope of the tangent line as a limit of slopes of secant lines

the formula $\dfrac{f(x+h)-f(x)}{h}$, and its relation to instantaneous velocity and tangent lines

limits and the intuitive meaning of $\lim_{x\to a} f(x)$

using a table of values to determine a limit (and why a table doesn't prove the answer)

computing limits by "plugging in" (as justified by Theorems 2.2 and 2.3 in Section 2.3)

using algebraic simplification before computing a limit; limits "of the form $\frac{0}{0}$"

algebraic simplification by rationalizing the numerator or denominator

the Squeeze Theorem, how to apply it, and an intuitive idea of why it is valid

one-sided limits from the left or from the right, $\lim_{x\to a^-} f(x)$ and $\lim_{x\to a^+} f(x)$

$\lim_{x\to a} f(x)$ exists if and only if both $\lim_{x\to a^-} f(x)$ and $\lim_{x\to a^+} f(x)$ exist and are equal

limits of "split functions"

reading limits from graphs (including one-sided limits)

how limits can fail to exist (jumps, missing points, infinite oscillation, vertical asymptotes)

the precise definition of $\lim_{x\to a} f(x) = L$, from Section 2.7

the relationship between *limits* and *approximation*

infinite limits; meaning of $\lim_{x\to a} f(x) = \infty$ and $\lim_{x\to a} f(x) = -\infty$

infinity is not a number; if $\lim_{x\to a} f(x) = \infty$, we say that the limit does not exist

infinite one-side limits, from the left or right

vertical asymptotes, and their relation to infinite limits

computing infinite limits; limits "of the form $\frac{k}{0}$", where $k \neq 0$

limits at infinity; meaning of $\lim_{x\to\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$

computing limits at infinity

horizontal asymptotes, and their relation to limits at infinity

finding asymptotes of functions by investigating their limits

limits and asymptotes of rational functions