Suggestions for Studying for the First Hour Exam

The following notes are intended as a guide for studying for the first hour exam in Math 135. The exact topics to be covered on the test vary from section to section. Students should check with their lecturer.

Many terms have been introduced already this semester. In general, students are not asked to state definitions on exams, but these terms will appear on the test and students need to know what they mean. It is strongly recommended that students make a list of all the terms that have been defined and be sure that they understand what these words and phrases mean.

The one definition that students are likely to be explicitly tested about is the definition of the derivative. If asked to compute the derivative of a function "from the definition", students should set up the derivative as a limit and evaluate that limit. (Of course, students can check themselves by using one or more of the differentiation rules, but this is scratch work and not part of the actual solution.)

Students should be able to do the following standard computations:

- Evaluate limits, both one-sided and two-sided, including limits related to the following key limits:
$$\lim_{h\to 0} \frac{\sin h}{h}, \qquad \lim_{h\to 0} \frac{\cos h - 1}{h}.$$
Students who learned about l'Hôpital's Rule in another course should be able to evaluate limits without using that result.

- Determine where a given function is continuous. Find values of a parameter in the piece-wise definition of a function that make the function continuous.

- Compute derivatives, either from the definition or by using the differentiation rules. Students are expected to know the derivatives of the following functions: $\sin x$, $\cos x$, $\tan x$, $\sec x$, e^x, and $\ln x$.

- Find tangents and normals to the graphs of functions at specified points.

- Answer questions about functions that are described by formulas, by tables of values, or by graphs.

- Apply the techniques learned to "real world" problems. The main applications studied so far are studying exponential growth and decay of biological communities and radioactive elements, compounding of interest, and interpreting velocity and acceleration as derivatives.

Although students will not be tested explicitly about the properties of the trigonometric, exponential, and logarithmic functions, students are expected to be familiar with these functions and will need to use properties of them to solve problems.

Students should pay particular attention to results that have been given distinctive names or titles. Two examples are the Squeeze Rule and the Intermediate Value Theorem.

In preparation for the exam, students should review all of the assigned homework problems and try similar problems, both in the exercises at the ends of the sections and in the review material at the ends of the chapters. Trying odd numbered problems makes it possible to check the answers.

In mathematics, using a valid method to solve a problem is just as important as getting the correct answer. On the exam, students should show enough of their work to make clear how they arrived at their answer. A correct answer obtained by an incorrect method will not get full credit.

Students might also consider practicing their calculus skills under the pressure of a time limit. This could be done by copying out the statements of roughly six to eight problems from the text of the type discussed above and trying to write out careful solutions to these problems in 80 minutes without looking at the book or class notes.