Mathematics 242 – Principles of Analysis
Review Sheet – Midterm Exam 3
November 22, 2004

General Information

As you know from the course syllabus, the third and final midterm exam for the course will be given in class on Friday, December 3. This be an individual closed book exam similar in format to the other midterms we have done this semester. I will be happy to hold a late afternoon or evening review session to help you prepare. Late afternoon times are possible Wednesday, December 1, but I will have to leave campus no later than 5:30pm to get to a rehearsal, so Wednesday evening will not work for me that week. Tuesday or Thursday evening would be OK too.

Topics to be Covered

The exam will cover the material we have covered since the last exam, starting with the material on limits of functions, and going through the discussion of the Fundamental Theorem of Calculus from class on Monday, November 22. This is sections 20, 21, 22, 25, 26, 27, 29, 30, 31 in the text, but as before, not all the topics in those sections were discussed in class. You are responsible for only what we did talk about:

1) The definition of the statement $\lim_{x \to c} f(x) = L$, consequences, limit theorems, techniques for computing limits.
2) The definition of continuity and its consequences, key properties of continuous functions on a closed interval: The Intermediate Value and Extreme Value Theorems.
3) The definition of differentiability and examples, the Mean Value Theorem and its consequences.
4) L'Hopital's Rule for limits.
5) The definition of integrability, computations of definite integrals from the definition, the Fundamental Theorem of Calculus.

What to Expect

The exam will have four or five questions, each possibly with several parts. Some questions will ask for a precise statement of a definition or a theorem we have discussed. Be prepared to give careful statements of the definitions noted above and know how to use them (for instance how to show that a limit exists using the ε, δ definition). Also know and be able to give these proofs:

1) The Mean Value Theorem.
2) A monotone increasing function on an interval $[a, b]$ is integrable.
3) The Fundamental Theorem of Calculus, "part 1"

The other questions will be similar to questions from the problem sets and discussions.

(over for review problems)

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Some good review problems to look at are

Section 20/3bdfh,4b,5,15
Section 21/5,8
Section 22/questions like 4-9
Section 25/3bcd,6,8
Section 26/10 (Hint: use the MVT),11,15
Section 27/4
Section 29/3,11
Section 30/12,13