Math 231, Section U1
Exam 2 Checklist
Sections 8.1-8.5

Introduction
This is an outline of material I expect you to know for Exam 2. Details are omitted, but it should give you a good idea of what to concentrate on. Problems from the quizzes, examples in class and the problems from the homework should also give you a good idea of what material will be covered on the test. For this Chapter, I especially recommend looking at the "writing exercises" in addition to the problems, as they will help you understand the concepts. To prepare for the test, you should get lots of practice and be sure you understand why you are doing what you are doing! Get help ASAP if you need it.

Section 8.1: Sequences
Know:

- what a sequence is, and know and understand the definition of convergence for a sequence (Definition 1.1)
- how to prove $\lim_{n\to\infty} a_n = L$ using the definition of convergence for simple sequences like, for example, $a_n = \frac{2}{n}$ and $a_n = \frac{1}{n^2}$
- how to find the limit of a sequence, including:
- how to use Theorem 1.2 and L'Hopital's rule to help show a sequence converges or diverges
- how to use the Squeeze Theorem and its Corollary 1.1 to show a sequence converges
- generally, how to deal with sequences where the terms have alternating signs
- the definitions of increasing, decreasing, monotonic and bounded, and how to show that a sequence is increasing, decreasing or bounded
- how to use Theorem 1.4 to show a sequence converges

Section 8.2: Infinite Series

- Know how to use Σ notation (see Ch. 4)
- Know what a series is, and what a partial sum is
- Know and understand the definition of convergence for a series
- Be able to identify geometric series, and determine whether they are convergent. For the convergent ones, be able to find the sum of the series
- Be able to identify telescoping series and find their sums

- Know the Kth Term Test for Divergence (Be able to state it) and how to use it
- Know the what the harmonic series is, and that it is an example of why $\lim_{k\to\infty} a_k = 0$ DOES NOT imply the series converges.
- Know all the theorems in the section. You don't need to memorize the theorem-numbers, but you need to be able to state them and use them to help you tell whether or not a given series converges or diverges.
- BE CAREFUL, don't get sequences and series mixed up!

Section 8.3: Integral Test and Comparison Tests

- Know ALL the tests in the section by name and be able to state them and use them correctly
- Don't forget to verify the hypotheses of the tests when you are using them!
- Know the Error Estimate for the integral test and how to use it to help approximate sums of infinite series by their partial sums to within a given error
- Know what a p-series is, and know the p-test which determines when a "p-series" converges and when it diverges
- Recognize when a Comparison test is inconclusive
- Recognize when a Limit Comparison Test is inconclusive, (it may also help to know the expanded cases from problems 37 and 38.)
- Be able to use the theorems and tests to do simple proofs, like the one in problem 36.

Section 8.4: Alternating Series
Know:

- Know the definition of alternating series
- Know the Alternating Series Test (AST) and be able to use it
- Know how to show whether an alternating series is divergent using the Kth Term Test
- Know how to use the Error Estimate for alternating series, and how to approximate the sum of an alternating series to within a given error
- Know that the AST does not tell you whether a series is absolutely convergent

Section 8.5: Absolute Convergence and the Ratio Test

- Know the definition of absolute convergence, If its series of absolute values converges, then the series converges absolutely.
- Know Theorem 5.1, that if a series converges absolutely, then it converges.
- Know the difference between the two modes of convergence: absolute convergence and conditional convergence Remember to look at the series of absolute values.
- Know the Ratio Test and the Root Test and what the different values of L tell you. Particularly remember that $L = 1$ tells you nothing.

Generally, given a series, be able to determine if it converges or diverges and say why, specifically citing the tests you're using.