Math 221 Section CL1
Midterm Exam II Study Guide

0.1 General information

- **Exam date and time:** The exam will be given during the recitation class time **Thursday, 10/30/2008**, **3:00 pm - 3:50 pm** or **4:00 pm - 4:50 pm**. Please attend your regular recitation class period; the TA will have only enough exams for registered students in each recitation class.
- **Exam rules:** No books, notes, calculators, IPods, blackberries, etc. are allowed. You should be prepared to show your student ID if requested when turning in your exam. Cheating is a violation of the Student Honor Code and any instances of cheating will be reported to the University Academic Affairs Committee. A copy of the Student Honor Code pertaining to Academic Integrity can be found at:

  `www.admin.uiuc.edu/policy/code/` §1-402
- **Review sessions:** Part of the lecture class on **Wednesday, 10/29/2008** will be used as a review session for the exam. Please be prepared with questions for the lecturer about material in the book, material from the lectures, or homework or quiz problems.

0.2 Exam content

The exam will cover sections 1.2 – 1.4 (limits and continuity), 2.1 – 2.3 (derivatives), 4.3 and 4.4 (definite integrals), 4.7 (numerical methods for integration), 4.8 (indefinite integrals) and 5.1 – 5.3 (applications of integration) in the book by Smith and Minton, with the exception of the following topics:

- higher order derivatives (pages 175–177)
- average values and Integral Mean Value Theorem (pages 377–380)

The exam will have 5 or 6 questions, some of which may have multiple parts. The majority of the test will focus on definite and indefinite integrals, numerical methods for integration and applications of integration. Some questions may be aimed at conceptual knowledge: statements of definitions, convergence tests, or formulas. Other questions will be more computational, similar to homework problems. At least one of the problems will have an "applied" component, and will be related to the previous labs.

Since calculators are not allowed on the exam, there will be no problems asking you to explicitly compute a Riemann sum (or other) approximation to a definite integral. You should be prepared, however, for conceptual questions related to numerical approximation of integrals, especially in connection with the Error Bound Theorems for the various numerical methods.

0.2.1 What you should be able to do

- Understand the concept of the limit of a function at a point, and be able to answer questions about limits, given a function in various forms (as a formula, as a graph, as a table, etc.). Understand the difference between a one-sided limit and a two-sided limit. Analyze continuity of a function. State and apply the Intermediate and Extreme Value Theorems for continuous functions on closed intervals.
- Define Riemann sums and definite integrals. Compute Riemann sums and their limits for simple functions, including power functions. Understand and use geometric interpretations of definite integrals.
- Know the difference between the Midpoint Rule, Trapezoid Rule and Simpson's Rule for approximating integrals, and the associated Error Bound theorems.
- Understand the difference between definite and indefinite integrals. Relate properties of a function with properties of its indefinite integrals. Discuss properties of a function defined via an indefinite integral.
- Set up integrals describing areas of planar regions and volumes of solids with specified cross-sectional areas, including solids of revolution via methods of discs/washers or shells. Evaluate for polynomial integrands. Set up integrals describing other physical problems (work, energy, force, etc.).
- Know the definition of the derivative and its physical and geometric interpretations.Compute derivatives of power functions and polynomials. Compute slopes and equations of tangent lines.