Spring 2007

Math 252A – Accelerated Calculus II (4)

Course Description: Integration techniques and applications, series and approximations, differential equations, introduction to vectors.

Prerequisite: A grade of B or better in 241 or 251A and consent.

Text: *Calculus, Early Vectors* by James Stewart.

Topics:

Week 1–2: Inverse Functions. Inverse functions (4.2), logarithms and exponentials (6.6), exponential growth and decay (4.5), differentiation rules and applications for logarithm and exponential functions (4.1) and (4.4), inverse trigonometric functions (4.6), and l'Hospital's rule (4.8). The section on hyperbolic fuctions (4.7) can be cut short.

Week 3–5: Techniques of Integration. Integration by parts (8.1), trigonometric integrals (8.2), trigonometric substitution (8.3), rational functions and partial fractions (8.4), rationalizing substitutions (8.5), strategy for integration (8.6), and improper integrals (8.9).

It is not necessary to cover all the techniques of integration in Sections 8.2–8.4 in detail, but the students should gain some facility at integration. Section 8.7 (use to integral tables and computer algebra systems) and Section 8.8 (numerical mathods) can be delegated to the lab.

Week 6–9: Infinite sequences and series. Convergence of infinite sequences and series, power series, Taylor and MacLaurin series (Chapter 10). The book's treatment of the remainder estimate for Taylor series is brief and should be expanded.

Week 10–12: Differential equations. First order separable and linear differential equations (9.1 and 9.2) and second order linear differential equations with constant coefficients (15.1–15.3). It is desirable to cover series solutions of differential equations (15.4).

Additional topics: As time allows, curve length (9.3, parametrized curves from 1.3 were discussed, but possibly cut short, in the first semester of calculus), area of surfaces of revolution (9.4), moments and centers of mass (9.5).

If these topics are covered, then they should be covered in the first half of the semester as applications of integration. Advanced planning on the part of the instructor is required to decide how much time to devote to these topics. In the context of differential equations, one can spend some time on systems of first order differential equations (e.g., predator/prey models or competing species). In this context one can work with direction fields and reinforce vector concepts. Approximate solutions can be obtained using Euler's method during the lab.

Lab Component: This is a 4–credit course. It meets for 150 minutes of lecture and for 50 minutes in the computer lab. Much of the lab time should be spent using a CAS (Computer Algebra System) to work on calculus problems and projects related to the material currently covered in class. The textbook offers many appropriate problems, and the instructor may pose additional ones. Occasionally one may work with problems related to Calculus I, or use the hour to hold a recitation session. The purpose of the extra hour is to give the students practice and experience with calculus problems, provide intuition, and deepen the understanding. The students got a first exposure to the CAS that we use (Derive for Windows) in Calculus I. It is easy enough so that almost all effort can be spent on the subject matter calculus.