COURSE OUTLINE FOR MATH 212: CALCULUS I

Text: Calculus with Analytic Geometry, by
Larson, Hostetler, and Edwards, Houghton Mifflin Company

CHAPTER — APPROXIMATE WEEKS

1. Limits and Their Properties — 1.5

Do
A Preview of Calculus
Finding Limits Graphically and Numerically
Evaluating Limits Analytically
Continuity and One-Sided Limits
Infinite Limits

Omit the formal definition of limit in section 1.2, and the proofs of theorems throughout the course. You may omit the Squeeze Theorem on p.63 of section 1.3 and the Intermediate Value Theorem on p. 75 of section 1.4. The goal is to have students understand the limit as h approaches 0, which is needed in Chapter 2.

2. Differentiation — 3.5

Do
2.1 The Derivative and the Tangent Line Problem
2.2 Basic Differentiation Rules and Rates of Change
2.3 The Product and Quotient Rules and Higher-Order Derivatives
2.4 The Chain Rule
2.5 Implicit Differentiation
2.6 Related Rates

Do all techniques very carefully. You have to omit the proofs of theorems, but discuss what the theorems say. Be sure to do velocity and acceleration problems by using differentiation rules and, in general, to assign many word problems.

3. Applications of Differentiation — 4.0

Do
3.1 Extrema on an Interval
3.3 Increasing and Decreasing Functions and the First Derivative Test
3.4 Concavity and the Second Derivative Test
3.5 Limits at Infinity
3.7 Optimization Problems
3.8 Newton's Method

Go light on or omit 3.6 A Summary of Curve Sketching. In section 3.9 Differentials, do only the definition of the differential and its connection to linear approximations to a function.

Omit 3.2 Rolle's Theorem and the Mean Value Theorem.

Students have a great deal of difficulty with the material in this chapter. Do loads of examples. Omit proofs. In section 3.5, omit the formal definition on p.192. In section 3.6, appropriate technology can be used; one approach is to analyze graphs, rather than sketch them. Go heavy on section 3.7.

4. Integration: 4.0

Do

4.1 Antiderivatives and Indefinite Integration
4.2 Area
4.3 Riemann Sums and Definite Integrals
4.4 The Fundamental Theorem of Calculus
4.5 Integration by Substitution
4.6 Numerical Integration

Emphasize velocity and acceleration problems in section 4.1.

There probably isn't sufficient time to cover all the theoretical details of sections 4.2, 4.3, and 4.4; don't get bogged down in the details. Suggestions are below:

- Cover sigma notation in section 4.2, but not necessarily the formula for sums of n positive integers, their squares and cubes. Cover the concepts of upper and lower sums and area, but do numerically and graphically using technology. It is not necessary to get a closed form of these sums using n intervals.

- In section 4.3, pay minimal attention to partitions where subintervals are of unequal length, and to the notion of the norm of a partition.

- The Mean Value Theorem for Integrals and The Average Value of a Function in section 4.4 are optional. The Second Fundamental Theorem of Calculus is needed in Calculus II for the definition of the natural logarithm function.

In section 4.6, cover the Trapezoidal Rule; Simpson's Rule is optional.

Review and Testing 1.0

Total 14.0