

Spring 2007

Math 241 – Calculus I (4)

Course Description: Basic concepts, differentiation with applications, integration.

Prerequisite: A grade of C– or better in Math 140 or Math 215 or assessment exam.

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

Computer Lab: For one hour a week, the class is scheduled in the computer lab, PSB 208. During this hour you may hold a recitation or an actual lab session. If you hold this hour in a different room, then it is your responsibility to arrange that the lab is monitored or locked. There is a separate list with suggested lab topics.

Gateway Exam: You are encouraged to use the differentiation gateway exam. Students shall receive a grade C or better for the course only if they pass the exam.

Week 1, Chapter 0 & 1: Review and Vectors in the Plane.¹ Present your syllabus and go over the academic expectations from the department website. Much of Chapter 0 can be left to the students to review. Cover Sections 1.1 and 1.2, vectors in the plane, their algebra, dot product, and length. Parametrized curves from Section 1.3 may have to be cut short.

Week 2–3, Chapter 2: Limits and rates of change. Define the notion of a limit, calculate some limits from scratch and using the limit laws, continuity, asymptotes, tangents.

The material in Section 2.4 may be incorporated throughout. Cover only as much of Section 2.6 as time allows. Examples as in Section 2.7 may be introduced as motivating examples in previous sections.

¹Some instructors prefer to start out slowly, and they might need an extra week for the material from Chapters 0–2. They will have to try and catch up later on in the semester.

Week 4–6, Chapter 3: Derivatives. Define the derivative and differentiability. Calculate derivatives from scratch and using rules (linearity, product and quotient rule, chain rule). Derivatives of the trigonometric functions, implicit differentiation, related rates, higher derivatives, linear approximation. You may omit or cut short Sections 3.3 (Rates of change in Natural and Social Sciences), Section 3.9 (Slopes and tangents of parametrized curves), and the quadratic approximation in Section 3.11.

Week 7–10, Chapter 5: Applications of Differentiation. Definition of absolute and local extrema, Extreme Value Theorem for continuous functions, critical points. Mean Value Theorem, 1st derivative and monotonicity, 2nd derivative and concavity, first and second derivative tests for local extrema. Sketching of graphs, discuss all of the above, plus absolute extrema and long term behaviour (limits at $\pm\infty$, horizontal and slant asymptotes). Applied maximum and minimum problems.

The material in Section 5.1 is motivational and repeated in the following sections. Section 5.4 is about the use of calculators and computers in graphing functions. It is covered continuously in the lab, and does not need to be taught as a separate unit.

Week 11–15, Chapter 6 and 7: Integration. Antiderivatives, sigma notation, concept of area, the definite integral, the Fundamental Theorem of Calculus, calculate integrals using the Fundamental Theorem, substitution, areas between graphs. Skip Section 6.6 (The Logarithm defined as an Integral), it will be covered in the second semester. Cover as much as you can from Chapter 7, the calculation of some volumes using slices, disks, and shells. Review