NEW MEXICO STATE UNIVERSITY

Department of Mathematical Sciences

Mathematics 191 - Calculus and Analytic Geometry I

3 credits

Information For Instructors

Catalog Description: Algebraic, logarithmic, exponential and trigonometric functions, theory and computation of derivatives, approximation, graphing and modeling. May include an introduction to integration.

Prerequisite: Grade of C or better in Math 190.

Text: *Single Variable Calculus (Early Transcendentals)*, Jon Rogawski, Freeman.

Objectives: The goals are to present the concepts of calculus, stressing techniques, applications, and problem solving, and emphasizing numerical aspects such as approximations and order of magnitude. Overall, the goals are to illustrate the power of calculus as a tool for modeling situations arising in physics, science, engineering and other fields. In fulfillment of these goals, this and later courses will stress topics such as polynomial approximation, setting up integrals, differential equations, as well as the use of appropriate technology.

Midterm and Final Exams: This course is required to have a uniform common final exam. Math 191 will have two common midterm exams, to be held on Thursday of the 6^{th} and 12^{th} weeks of the semester, from 7-8:30pm. There will also be regularly scheduled makeup exams on Friday after each exam, from 4-5:30pm. The issue of any additional makeups will be left up to the instructors.

Review of Precalculus Topics: The textbook begins with a lengthy review of precalculus. While some review of important precalculus topics (especially trigonometric functions and exponential functions, and their inverses) should be done at the start of the semester, students should not be given the impression that this is new material. Hence it is recommended that instructors begin calculus concepts as quickly as possible. Further review of precalculus topics (equations of lines, polynomials and rational functions) can then be integrated into the course as these topics become pertinent.

On-line homework: All sections of the course will assign a common set of homework problems, which should be available both in the textbook and on WebAssign. This is intended to be a minimal subset of all course assignments. Instructors are free to add problems to the assignment, and assign other work as desired, either from the book or on-line. Homework should be assigned

liberally. However, unless it can be verified that students are responsible for the work they submit, on-line homework should not count for a high percentage of the course grade.

Lab Sections: The fourth hour will be staffed by graduate assistants, and will be run as a problem-solving session, focusing on the common on-line homework problems. This will provide somewhat uniform preparation for the common exams. More individual section work (e.g. projects, other homework) will be done in the hours the instructor teaches. This will help to ensure that GAs running multiple sections are not overburdened.

Other means of assessment: Instructors are encouraged to use reading quizzes, short quizzes based on homework, and other means of assessing student work, especially early in the semester. This helps instructors to learn students' names quickly, to provide regular feedback, and to generate classroom discussion.

Projects: NMSU's Department of Mathematical Sciences has a strong tradition in discovery based learning, especially in calculus courses, including producing one of the MAA's all-time bestseller's "Student Research Projects in Calculus." Instructors are encouraged to give a few to several short projects during the semester. The department has resources for these projects (see the bookcase on the south wall of the reading room) and instructors are encouraged to work with coordinators in developing new or modifying existing projects. Care should be taken so that projects do not run up against exams.

Content: The course will cover the first four chapters of *Single Variable Calculus*.

The following table provides a possible schedule for covering topics, administering exams and projects, and so on. Instructors are encouraged to provide students with a week by week schedule of topics with dates for midterms and/or projects, prepared in consultation with the course coordinator. Instructors should consider the topics for in-class projects, as well as the actual dates of fall break and Thanksgiving or spring break, before the semester so that time can be allotted appropriately on the syllabus.

Week	Sections	Notes
1	1.4-1.6	Trigonometric, exponential, and logarithmic functions (excluding hyperbolic functions)
2	2.1-2.2	Rates of change, secant and tangent lines; limits. Review of linear functions (1.2)
3	2.3-2.5	Limit laws, continuity, methods for evaluating limits (limits at infinity are treated in Section 4.5)
4	2.5-2.7	Squeeze Theorem; Intermediate Value Theorem
5	3.1-3.3	Derivatives; differentiation rules
6	3.3, review	EXAM 1
7	3.4-3.6	Rates of change; higher derivatives; derivatives of trigonometric functions
8	3.7, 3.8	The Chain Rule; implicit differentiation

9	3.9, 3.10	Derivatives of inverse functions, including inverse trigonometric functions (but excluding hyperbolic functions); derivatives of exponentials and logarithms, logarithmic differentiation
10	3.11, 4.1	Related rates, linear approximation, applications
11	4.2, 4.3	Extreme values; the Mean Value Theorem
12	4.4, review	Shapes of graphs. EXAM 1
13	4.5, 4.6	Graph sketching; applied optimization. Student evaluations.
14	4.7, 4.9	L'Hopital's Rule; antiderivatives
15	Review and FINAL EXAM	

* Note: Newton's method (4.8) provides a possible project toward end of semester.

Revised by Daniel Ramras, December 2009

Approved by the Undergraduate Curriculum Committee, December 2009