Mathematics 111
Fall, 2002

Textbook: Larson, Hostetler, and Edwards, *Calculus of a Single Variable: Early Transcendental Functions,* Third Edition.

Instructor: Dr. Michael Rogers.
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Hours: **MWF 2:00–3:00** or by appt. I'm free most afternoons.

Course Content: Mathematics 111 is the first semester of single-variable calculus. The main topics are the limits, differentiation, and integration of functions and the applications of these processes; they include the analysis of algebraic, trigonometric, natural logarithmic, and natural exponential functions. A calendar of topics is attached to this syllabus.

Course Goals: After this course, the student should be able to do the following: to find the limit, derivative, antiderivative, and definite integral of a function; to understand the basic theoretical underpinnings of these processes; to understand the relationships between these processes, rates of change and the graph of a function; and to apply these processes in solving problems on rates, extrema, area, volume, and approximation.

This course also seeks to develop the following capacities of the student: to reason logically; to use intuition and creativity in solving problems; to appreciate the cogency of a sound argument; to understand numbers, especially the continuous and infinite nature of the system of real numbers.

An overall goal is to provide a solid foundation for success in Mathematics 112.

Classes: The student is responsible for work covered in class. In addition to the regular class meetings, there will be optional SI sessions and help sessions. There will also be four tests and a gateway exam scheduled on Tuesday mornings. (See below).

Homework: (50 points.) Homework assignments are given almost every day and are for the student's benefit. It is important that the student complete each assignment in a timely fashion. Your instructor will tell you when and how homework is to be collected and evaluated.

Problem Sets: (100 points.) Four sets (worth 25 points each) of challenging problems will be handed out. Usually a week will be allowed for completion of the problems. Students should begin the problems sets on their own, but they may collaborate with each other. A student may collaborate only with other students currently taking this course. He or she may not seek help from SIs, tutors, or anyone else not enrolled in this course. However, the final written solutions must be in the student's own words. Style and reasoning will be important factors in grading.

Quizzes: (160 points.) All quizzes are announced and "take-home." The student must be present in class to receive each quiz. The student must work each quiz at *one sitting* and use only *authorized materials.* In general no books, notes, or calculators will be allowed. Each quiz is due in class at the class meeting following the receipt of the quiz. Each quiz is worth 20 points. Three quizzes will be given during each test unit and the best two of them will be counted. In total there will be 12 quizzes of which 8 will be counted.

Gateway Exam: (50 points.) In order to pass this course the student must pass an examination on derivatives at a rate of 100%. The exam will first be offered at

8:30 a.m., Tuesday, October 1

Each re-test will be different but very similar to the original test. The exam must be passed by the last day of classes. The student will be allowed at least four opportunities to pass it.

Computer Graphing Portfolio: (50 points.) Using Graphmatica, a graphing application available through the campus network, the student is to prepare a portfolio of computer printouts. The specific requirements for this project will be assigned at the appropriate point in the semester.

Tests: (400 points.) In general, calculators will not be allowed on tests. Four tests (100 pts. each) will be given on the following days:

8:00 a.m., Tuesday, September 17
8:00 a.m., Tuesday, October 8
8:00 a.m., Tuesday, November 5
8:00 a.m., Tuesday, November 26

Final Exam: (200 points.) A cumulative final exam will be given at the time scheduled by the Registrar.

Excuses: Excuses deemed legitimate by the instructor will be handled according to the individual circumstances.

The student is expected to take all tests and exams at the scheduled times. For legitimate excuses arrangements will be made to take a test **prior to** the testing time. There will be no make-up tests given after the testing time.

Written Style: Thoughts are expressed by sentences: just so in mathematics. Pay attention to your textbook: it is written in sentences. **Your written work must be in complete sentences.** Note "$1+1=2$" is a complete sentence (it has a subject "$1+1$", verb "=" and predicate "2"). Use mathematical symbols wherever appropriate. Your work also needs to be neat and orderly to be intelligible. See Priestley, "Clean Writing in Mathematics," pp. 413–420 in *Calculus: An Historical Approach,* which is on reserve in the library.

Grading: Evaluation will be based on the following written work:

Tests (4 @ 100 pts)	400 points
Problem Sets (4 @ 25 pts)	100 points
Quizzes (8 @ 20 pts)	160 points
Gateway Exam	50 points
Computer Graphing Portfolio	50 points
Homework	50 points
Final	200 points
Total	1010 points

The plus/minus system will be used with the following rough guide to letter grades:

A	900 points and up	D	600–699 points
B	800–899 points	F	below 600
C	700–799 points		

Tips for Success: Calculus is hard, but it can be made easier by intelligent and efficient study habits.

Gauss said the purpose of calculation is insight. Insight is an understanding into why things work the way they do. This should be the goal of working out problems. Know **why** each step is correct. This is more than knowing **that** each step is correct.

Although the supplemental exercises are not graded, it is important for the success of the student that they be completed as soon after covering the material as possible. While collaboration is encouraged, each student should be sure that he or she ultimately can **solve problems unaided by notes, the textbook, or other people**.

Practice good style on homework. A clean style helps to clean up messy thinking.

In general the student will need to study at least six good hours per week exclusive of the time spent on quizzes, problem sets, and review for tests.

Tests are performances, similar to those by athletes, musicians, and dancers. Prepare for them in similar ways. Begin practicing for them weeks in advance.

SI/Help Sessions/Tutoring: The SI program is a twice weekly program of optional, organized study sessions. The sessions are not meant to be tutoring sessions. The supplemental instructor (SI) is a student who has taken the course before, has a good understanding of the material (but probably not as complete as the instructor!), and knows how to succeed in the course.

Help sessions will be scheduled as there is demand for them. Attendance is optional.

The schedule for student tutors will be announced when available.

Honor Code: The Honor Code of Oxford College applies to all work submitted for credit in this course. To receive credit for work submitted you must place your name on it. By placing your name on such work, you pledge that the work has been done in accordance with the given instructions and that you have witnessed no Honor Code violations in the conduct of the assignment.

You may always ask the instructor any question about an assignment.

Proposed Calendar

Date	Topic	Section
28 Aug.	1. Algebra and functions	See Chapter P
30 Aug.	2. Review cont'd; limits	
4 Sep.	3. Limits cont'd	(1.1–1.3, 1.6, 3.5)
6 Sep.	4. Limits cont'd	
9 Sep.	5. Continuity	(1.5)
11 Sep.	6. Intermediate Value Theorem	(1.5)
13 Sep.	7. Introduction to the derivative	(2.1)
16 Sep.	8. Review	
17 Sep.	**Test 1 at 8:00 a.m.**	
18 Sep.	9. Rules of differentiation: special functions	(2.2, 2.3)
20 Sep.	10. Rules of differentiation: general rules	(2.2, 2.3)
23 Sep.	11. Chain Rule	(2.4)
25 Sep.	12. Implicit differentiation	(2.5)
27 Sep.	13. Derivatives of inverse trigonometric functions	(2.6)
30 Sep.	14. Review of differentiation	
1 Oct.	**Gateway Exam at 8:30 a.m.**	
2 Oct.	15. Related rates	(2.7)
4 Oct.	16. Related rates cont'd	
7 Oct.	17. Review	
8 Oct.	**Test 2 at 8:00 a.m.**	
9 Oct.	18. Extrema on a closed interval	(3.1)
11 Oct.	19. Mean Value Theorem	(3.2)
16 Oct.	20. Graphs: polynomials	(3.3, 3.4; handout)
18 Oct.	21. Graphs: rational functions	(3.6; handout)
21 Oct.	22. Graphs: algebraic functions	(Handout)
23 Oct.	23. Optimization problems	(3.7)
25 Oct.	24. Review	
28 Oct.	25. Antiderivatives; introduction to substitution	(4.1,4.5)
30 Oct.	26. Differential equations	(5.1,5.2)
1 Nov.	27. Sigma notation; induction	(4.2)
4 Nov.	28. Review	
5 Nov.	**Test 3 at 8:00 a.m.**	

6 Nov.	29. Review of induction; introduction to integration	
8 Nov.	30. The definite integral	(4.3)
11 Nov.	31. The definite integral cont'd	(4.3)
13 Nov.	32. Fundamental Theorem of Calculus	(4.4)
15 Nov.	33. Substitution	(4.5)
18 Nov.	34. Substitution cont'd	(4.6, 4.7)
20 Nov.	35. Review of integration	
22 Nov.	36. Area Between Curves	(6.1)
25 Nov.	37. Review	
26 Nov.	**Test 4 at 8:00 a.m.**	
2 Dec.	38. Volumes of Revolution	(6.2, 6.3)
4 Dec.	39. Volumes of Revolution	(6.2, 6.3)
6 Dec.	40. Review	
9 Dec.	41. Review for Final	