Mathematics 111
Spring, 2001

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

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WWW: `http://userwww.service.emory.edu/~mroge02/Math111/Index.html`
Hours: **M–F 2:00–3:00,** or take a chance and drop by. An appt. is surest.

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 Thursday mornings. (See below).

Homework: (80 points.) A homework assignment is due almost every day of class at the end of class. Generally all that will be recorded is whether the assignment was done. However, persistently shoddy work will be brought to the attention of the student and may be factored into the homework portion of the grade. The student must be present in class to turn in the homework. Late homework will not be accepted. Collaboration is allowed and encouraged. Working in groups can be an effective learning tactic.

Supplemental exercises from the textbook will be assigned at the beginning of each unit. These exercises will not be collected but are for the benefit of the student.

Problem Sets: (150 points.) Six 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. 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: (150 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 *alone* at *one sitting* and use only *authorized materials*. In general no books, notes, or calculators will be allowed. Each quiz is due at the class meeting following the receipt of the quiz. In total there will be 8 quizzes (25 points each) of which only the best 6 will be counted.

Gateway Exam: (100 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

8:15 a.m., Thursday, February 1

Each re-test will be different but very similar to the original test. The goal is for every student in the course to have passed the exam by the last day to drop the course, which is February 21. The exam must be passed by the last day of classes. The student will be allowed at least five opportunities to pass it.

Tests: (320 points.) In general, calculators will not be allowed on tests. Four tests (80 pts. each) will be given on the following days:

7:45 a.m., Thursday, February 8
7:45 a.m., Thursday, March 1
7:45 a.m., Thursday, March 29
7:45 a.m., Thursday, April 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:

Gateway Exam	100 points
Tests (4 @ 80 pts)	320 points
Problem Sets (5 @ 20 pts)	150 points
Quizzes (7 @ 15 pts)	150 points
Homework	80 points
Final	200 points
Total	1000 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. He will answer at his discretion.

Proposed Calendar

Date	Topic	Section
17 Jan.	1. Algebra and Functions Handout: *Review of Prerequisites.* Handout: *Graphs of Functions.* **DUE: HW** – None (of course).	(Handout)
19 Jan.	2. Limits Handout: *Introductory Notes on Limits.* **Problem Set 1 handed out. **DUE: HW** – *Introductory Notes on Limits,* Review questions 1–4, p. 13.	(Handout)
22 Jan.	3. Introduction to the Derivative **DUE: HW** – pp. 116f: 4, 10, 20, 50, 54.	(2.1)
24 Jan.	4. Rules of Differentiation **DUE: HW** – pp. 129f: 6, 12, 20, 52; pp. 140f: 2, 10, 52, 62, 72.	(2.2, 2.3)
26 Jan.	5. Chain Rule **Quiz A handed out **DUE: HW** – pp. 153f: 4, 8, 14, 22, 46, 48, 56. **Problem Set 1**	(2.4)
29 Jan.	6. Review **DUE: HW** – None. **Quiz A**	
31 Jan.	7. Implicit Differentiation **DUE: HW** – pp. 163f: 2, 4, 6, 22.	(2.5)
1 Feb.	**Gateway Exam at 8:15 a.m.**	
2 Feb.	8. Inverse Functions **Quiz B handed out **DUE: HW** – pp. 171f: 2, 14, 18, 20, 22.	(2.6)
5 Feb.	9. Related Rates **DUE: HW** – pp. 178f: 2, 4, 8, 12, 24. **Quiz B**	(2.7)
7 Feb.	10. Review **DUE: HW** – None.	
8 Feb.	**Test 1 at 7:45 a.m.**	
9 Feb.	11. Infinity **Problem Set 2 handed out. **DUE: HW** – pp. ??.	(Handout)
12 Feb.	12. Limits *Handout: *Limits.* **DUE: HW** – *Limits,* section II.C, p. 16: 1, 2; section III.H, p. 39: 3a, 4a.	(Handout 0–III)
14 Feb.	13. Limits Handout: *Limits* continued. **DUE: HW** – *Limits,* section IV.D, p. 42: 1, 4; V.C, p. 46: 1a, 2; VI.E, p. 50: 3; VII, p. 53: 2.	(Handout IV–VII)
16 Feb.	14. Continuity **Quiz C handed out **DUE: HW** – pp. 93f: 32, 44, 46, 48. **Problem Set 2**	(1.4)

19 Feb. 15. Intermediate Value Theorem (1.4)
DUE: HW – pp. 94f: 86, 90, 96.
Quiz C

21 Feb. 16. Derivatives Revisited (Handout)
DUE: HW – pp. ??.

23 Feb. 17. Derivatives Revisited (Handout)
**Quiz D handed out
DUE: HW – pp. ??.

26 Feb. 18. Extrema on a Closed Interval (3.1)
DUE: HW – pp. 200f: 4, 6, 12, 18, 34, 36.
Quiz D

28 Feb. 19. Review
DUE: HW – None.

1 Mar. Test 2 at 7:45 a.m.

2 Mar. 20. Mean Value Theorem; Monotonicity, Concavity (3.2,3.3,3.4)
**Problem Set 3 handed out.
DUE: HW – p. 207: 4, 8; p. 216: 10; p. 224: 6.

5 Mar. 21. Graphing Polynomial Functions (3.6)
DUE: HW – pp. 242f: 1, 2, 4, 77, 78.

7 Mar. 22. Graphing Rational Functions (3.5,3.6)
DUE: HW – p. 235: 75; p. 245: 73–76 all.

9 Mar. 23. Graphing Other Functions: Vertical Tangents, Cusps (3.6)
DUE: HW – p. 235: 83–86 all; pp. 244f: 69, 85–88.
Problem Set 3

12 Mar.
14 Mar. } *Spring Break*
16 Mar.

19 Mar. 24. Optimization, Linear Approximation (3.7,3.8)
**Problem Set 4 handed out
**Quiz E handed out
DUE: HW – pp. 252f: 2, 16; pp. 262f: 4, 14.

21 Mar. 25. Antiderivatives, Substitution (4.1,4.5)
DUE: HW – pp. 284f: 16, 22, 36, 40; p. 332: 8.
Quiz E

23 Mar. 26. Differential Equations (5.1,5.2)
DUE: HW – p. 378: 14; pp. 390f: 6, 36, 46.

26 Mar. 27. Optimization, Linear Approximation Revisited (3.7,3.8)
**Quiz F handed out
DUE: HW – None.
Problem Set 4

28 Mar. 28. Review
DUE: HW – None.
Quiz F

29 Mar. Test 3 at 7:45 a.m.

30 Mar. 29. Sigma Notation (4.2)
DUE: HW – pp. 296f: 8, 12, 16, 30.

2 Apr. 30. The Definite Integral (4.3)
DUE: HW – pp. 307f: 12, 16, 28.

4 Apr. 31. The Definite Integral (4.3)
**Quiz G.
DUE: HW – Handout *Computing Integrals*, p. 9: 1a).

6 Apr. 32. The Definite Integral (4.3)
**Problem Set 5 handed out
DUE: HW – Handout *Computing Integrals*, p. 9: 1c), 1d).
Quiz G

9 Apr. 33. Fundamental Theorem of Calculus (4.4)
DUE: HW – pp. 319f: 4, 10, 14, 28, 36, 58.

11 Apr. 34. Substitution (4.5)
DUE: HW – pp. 332f: 78, 80, 82, 88, 94, 106.

13 Apr. 35. Integrals of Logarithmic/Inverse Trigonometric Fns. (4.7,4.8)
**Quiz H handed out.
DUE: HW – pp. 348f: 2, 6, 16, 18; p. 355: 6, 22, 36.
Problem Set 5

16 Apr. 36. Review
**Problem Set 6 handed out
DUE: HW – None.
Quiz H

18 Apr. 37. Area Between Curves (6.1)
DUE: HW – pp. 413f: 6, 16, 22, 38.

20 Apr. 38. Volumes of Revolution (6.2,6.3)
DUE: HW – pp. 423f: 2, 4, 6,; pp. 432f: 2, 4, 14.

23 Apr. 39. Volumes of Revolution (6.2,6.3)
DUE: HW – p. 423: 12; p. 432: 22.
Problem Set 6

25 Apr. 40. Review
DUE: HW – None.

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26 Apr. Test 4 at 7:45 a.m.

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27 Apr. 41. Review for Final
DUE: HW – None.

30 Apr. 42. Review for Final
DUE: HW – None.