

Mathematics 111Z
Fall, 2001

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

Instructor: Dr. Karen Rogers.

Office: 115 Seney Hall

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Hours: **MWF 2–3, Tues 3–4** or take a chance and drop by. Also by appointment.

Course Content: Mathematics 111Z 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.

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

| | |
|---------------------------|-------------|
| Tests (4 @ 100 pts) | 400 points |
| Gateway Exam | 100 points |
| Problem Sets (4 @ 30 pts) | 120 points |
| Computer Project | 40 points |
| Quizzes (7 @ 20 pts) | 140 points |
| Final Exam | 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 | | |



Tests: The four tests will be given on the following days:

Tuesday, September 25 at 8:00 a.m.

Thursday, October 18 at 8:00 a.m.

Tuesday, November 6 at 8:00 a.m.

Tuesday, December 4 at 8:00 a.m.

Note that the tests are given outside of class. Calculators will not be allowed on tests.

Students are expected to take tests at the scheduled times. Any conflicts or problems will be handled on an individual basis. **If you have an excuse deemed legitimate by your instructor, arrangements will be made for you to take a test prior to the testing time.** Oversleeping is not a legitimate excuse. There will be no make-up tests given after the testing time.

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

Gateway Exam: 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 9

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 five opportunities to pass it.

Problem Sets: Four sets 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.

Computer Project: The student is to find functions whose graphs display certain characteristics. The program *Graphmatica* is available on the Windows (IBM-type) computers on campus. Specific instructions will be given out later. You may get help from the computer aides on the use of the computer, but *you* must create your own functions and you must not share functions.

Quizzes: All quizzes are announced and "take-home." You must work each quiz *alone* at *one sitting* and use only *authorized materials*. In general no books, notes, or calculators will be allowed. Do not look at the contents of the quiz until you are ready to start. Quizzes are due in class on the class day following your receipt of them. Each quiz is worth 20 points. There will be 9 quizzes of which the best 7 will be used in determining your grade.

Homework: Assignments from your text are at the end of this course guide. These assignments will not be collected but are for your benefit. It is essential that you complete assignments as they are assigned and that you come to class prepared. Collaboration is encouraged as discussion of the concepts often leads to their clarification. However each student should be sure that he or she ultimately can solve problems **unaided by notes, the textbook, or other people.**

Class Attendance: The student is responsible for work covered in class. Furthermore you are expected to have done the reading for each class. Your ability to get the most out of your professor and each class is greatly enhanced by being prepared.

SI/Help Sessions/Tutoring: The SI program is a 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.

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 and use proper notation.** 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.

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.

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.

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. She will answer at her discretion.

Mathematics 111Z

Homework Assignments

Thursday, 30 August

Trigonometric Functions and Identities

Text: NTF (Notes on Transcendental Functions) §A, §B
Exercises: NTF §A, p.10: All.
NTF §B, p.17: All.

Friday, 31 August

Graphing Trigonometric Functions

Text: NTF §C
Exercises: NTF §C, p. 23: All.

Monday, 3 September

Labor Day (no class)

Wednesday, 5 September

Solving Trigonometric Equations

Text: NTF §D
Exercises: NTF §D, p.30: All.

Thursday, 6 September

Inverse Trigonometric Functions

Text: NTF §E
Exercises: NTF §E, p. 36: All.

Friday, 7 September

Exponential and Logarithmic Functions

Text: NTF §F, §G
Exercises: NTF §F, pp. 51-2: All.
NTF §G, pp. 62-3: All.

Quiz A

Monday, 10 September

Exponential and Logarithmic Functions

Text: NTF §F, §G
Exercises: Handout.

Wednesday, 12 September

Limits

Text: Sections 1.1, 1.2
Exercises: §1.2: 3-21(odd), 45-48(all).

Thursday, 13 September

Functions and Limits

Text: Sections P.3, 1.3
Exercises: §P.3: 1, 3, 5, 11-15(all), 37.
§1.3: 1, 3, 5, 11-45(odd), 53-63(odd), 91, 93, 119.
Handout.

Friday, 14 September

Functions and Limits, Infinite Limits

Text: Sections 1.4, 1.5
Exercises: §1.4: 3-27(odd).
§1.5: 1-29(odd), 37-49(odd), 65-69(all).

Quiz B

Monday, 17 September

Continuity

Text: Section 1.4
Exercises: §1.4: 1, 31-55(odd), 61-67(odd).

Wednesday, 19 September

Intermediate Value Theorem, Limits at Infinity

Text: Section 1.4, 3.5
Exercises: §1.4: 89, 90, 92, 93, 102-106(all).
§3.5: 1-21(odd), 31, 33.

Thursday, 20 September

Trigonometric Functions and Limits, Squeeze Theorem

Text: Sections 1.3, 3.5
Exercises: §1.3: 69-83(odd), 84, 99, 100, 101, 103, 105.
§3.5: 23-29(odd).

Friday, 21 September

Introduction to the Derivative

Text: Section 2.1
Exercises: §2.1: 1, 3, 53-67(odd), 71, 72, 73, 75.

Quiz C

Monday, 24 September

Review for Test 1

Tuesday, 25 September

Test 1 at 8:00 A.M.

Wednesday, 26 September

Introduction to the Derivative, Rates of Change

Text: Sections 2.1, 2.2
Exercises: §2.1: 5-17(odd), 47-51(odd).
§2.2: 83-91(odd), 94, 95.

Thursday, 27 September

Rules of Differentiation

Text: Section 2.2
Exercises: §2.2: 1-25(odd), 37-69(odd), 73-81(odd), 103-107(all).

Friday, 28 September

Rules of Differentiation

Text: Section 2.3
Exercises: §2.3: 1-45(odd), 55-73(odd), 79, 80, 81.

Monday, 1 October

The Chain Rule

Text: Section 2.4

Exercises: §2.4: 1-31(odd), 43-119(odd), 131, 132, 157, 158, 159.

Problem Set 1 due.

Wednesday, 3 October

Implicit Differentiation

Text: Section 2.5

Exercises: §2.5: 1-51(odd), 74, 75.

Thursday, 4 October

Higher Order Derivatives, Induction

Text: Sections 2.3

Exercises: §2.3: 83-97(odd), 98.

Handout.

Friday, 5 October

Higher Order Derivatives, Logarithmic Differentiation

Text: Sections 2.3, 2.4, 2.5

Exercises: §2.3: 99, 102, 105-111(all).

§2.4: 125, 127, 129, 144.

§2.5: 53-61(odd)

Quiz D

Monday, 8 October

Review Derivatives

Exercises: Handout.

Tuesday, 9 October

Gateway Test at 8:30 AM

Wednesday, 10 October

Derivatives of Transcendental Functions

Text: Section 2.6

Exercises: §2.6: 1-29(odd), 33, 35, 41-46(all).

Thursday, 11 October

Related Rates

Text: Section 2.7

Exercises: §2.7: 1-45(odd), 54.

Friday, 12 October

Extrema on an Interval

Text: Section 3.1

Exercises: §3.1: 1-37(odd), 55, 59, 61-64(all).

Quiz E

Wednesday, 17 October

Review for Test 2

Thursday, 18 October

Test 2 at 8:00 AM

Thursday, 18 October

Graphing: Polynomials

Text: Sections 3.3, 3.4
Exercises: §3.3: 1-19(odd), 45, 47, 49, 55.
§3.4: 1, 3, 5, 59-62(all), 68, 70, 89, 90.
Graphing Handout, p. 3: Exercises, Part I.

Friday, 19 October

Graphing: Rational Functions

Text: Sections 3.5, 3.6
Exercises: §3.5: 83-86(all), [43-59(odd)].
§3.6: 49, 67, 69, [7-17(odd), 25, 27, 37-47(odd)].
Graphing Handout: Exercises, Part II (p. 9) & Part III (p. 16).

Monday, 22 October

Graphing: Algebraic Functions

Text: Sections 3.5, 3.6
Exercises: Graphing Handout, p. 24: Exercises, Part IV.
Problem Set 2 due.

Wednesday, 24 October

Mean Value Theorem

Text: Section 3.2
Exercises: §3.2: 1-17(odd), 25-39(odd), 47-57(odd), 54, 56.

Thursday, 25 October

Graphs of Derivatives

Exercises: §2.1: 27-34(all) §3.4: 55, 56, 65
§2.4: 121-124(all) §3.6: 1, 3, 5, 73-78(all), 85-88(all)
§3.3: 51-54(all) §4.1: 49-52(all), 97, 98.

Friday, 26 October

Optimization Problems

Text: Section 3.7
Exercises: §3.7: 1-37(odd), 41, 43, 47, 53.

Quiz F

Monday, 29 October

Linear Approximations

Text: Section 3.8
Exercises: §3.8: 1, 3, 7-23(odd), 43, 45.

Wednesday, 31 October

Antiderivatives

Text: Sections 4.1, 4.5
Exercises: §4.1: 1-47(odd), 91-96(all).
§4.5: 1-59(odd), 69-75(odd), 105, 106.

Thursday, 1 November

Antiderivatives

Text: Sections 4.1, 4.5
Exercises: Handout.

Friday, 2 November

Review of Graphing

Exercises: Handout.

Quiz G

Monday, 5 November

Review for Test 3

Tuesday, 6 November

Test 3 at 8:00 AM

Wednesday, 7 November

Antiderivatives and Differential Equations

Text: Sections 4.1, 4.5, 4.7
Exercises: §4.1: 53-85(odd).
§4.5: 61-67(odd).
§4.7: 1-29(odd), 51, 53.

Thursday, 8 November

Differential Equations and Applications

Text: Sections 5.1, 5.2
Exercises: §5.1: 1-19(odd), 27, 39, 45, 51, 57.
§5.2: 7-23(odd), 27-39(odd), 45-53(odd), 57-65(odd), 67, 68, 71, 72, 103.

Friday, 9 November

Sigma Notation

Text: Section 4.2
Exercises: §4.2: 1-33(odd).

Monday, 12 November

Introduction to Area

Text: Section 4.2
Exercises: §4.2: 35, 37, 39, 40, 41-49(odd).
Computer Project due.

Wednesday, 14 November

Riemann Sums and Definite Integrals

Text: Section 4.3
Exercises: §4.3: 1-19(odd), 25-35(odd).

Thursday, 15 November

Properties of the Definite Integral

Text: Section 4.3
Exercises: §4.3: 21, 23, 43-67(all).

Friday, 16 November

Fundamental Theorems of Calculus

Text: Section 4.4
Exercises: §4.4: 1-69(odd), 79-109(odd).

Monday, 19 November

Substitution and the Definite Integral

Text: Section 4.5
Exercises: §4.5: 77-95(odd), 107-110(all), 118.
§4.7: 37-43(odd).
Problem Set 3 due.

Wednesday, 21 November

Definite Integrals

Text: Section 4.8
Exercises: §4.8: 1-37(odd).
Handout.

Quiz H

Monday, 26 November

Estimating Integrals

Text: Section 4.6
Exercises: §4.6: 1-9(odd), 45.

Wednesday, 28 November

Area Between Curves

Text: Section 6.1
Exercises: §6.1: 1-25(odd), 37, 39, 47, 49, 51, 52, 63, 64, 69, 70.

Thursday, 29 November

Volumes of Revolution

Text: Section 6.2, 6.3
Exercises: §6.2: 1-29(odd), 40, 41, 42, 49, 53, 55.
§6.3: 1-23(odd), 29, 30, 35, 37, 39, 41.

Friday, 30 November

Volumes of Revolution

Text: Section 6.2, 6.3
Exercises: Handout.

Quiz I

Monday, 3 December

Review for Test 4

Tuesday, 4 December

Test 4 at 8:00 AM

Wednesday, 5 December

Arc Length

Text: Section 6.4
Exercises: §6.4: 1, 3, 5, 21, 25, 31, 35, 40.

Thursday, 6 December

Review for Final Exam

Friday, 7 December

Review for Final Exam

Problem Set 4 due.

Monday, 19 December

Review for Final Exam