

Mathematics 111, Calculus I
Fall, 2005 - Dr. Evelyn C. Bailey
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Textbook: Larson, Hostetler and Edwards, Calculus of a Single Variable: Early Transcendental Functions, D. C. Heath and Company, 3rd edition

Course Content: Mathematics 111 is the first semester of introductory calculus. Course content includes limits; continuity; the derivative; differentiation of algebraic, trigonometric, and the natural logarithmic and exponential functions; applications of derivatives; anti-derivatives; the definite integral; simple integration by substitution; and applications of the definite integral. A list of specific topics by day is attached. This is a beginning course. No prior exposure to calculus is needed!

Goals: By the completion of this course, the student should be able to:

- (1) Evaluate limits and interpret the results in relation to the graph of a function;
- (2) Define the derivative and relate this definition to the graph of a function and to the concept of "rate of change;"
- (3) Give proofs of the rules of differentiation.
- (4) Differentiate algebraic, trigonometric, logarithmic and exponential functions.
- (5) Apply the derivative to the graphs of functions, to optimization situations and to related rate problems.
- (6) Define the definite integral and its relationship to area and to volume.
- (7) Evaluate definite and indefinite integrals using algebra techniques and u-substitution.

In general, the student should be able to calculate derivatives, to evaluate limits and to evaluate integrals (both definite and indefinite). The student should be able to apply their calculations and evaluations to functions. The primary purpose of this course is to provide a solid foundation for success in Mathematics 112 since both Mathematics 111 and 112 provide the student with a year of college calculus.

Responsibilities:

* Each **student** has the following responsibilities:

1. Come prepared and on time to every class.
2. Complete all work on time with proper thought.
3. Consider that it is not always the fault of the instructor if the student doesn't understand the material. Use your outside help (office hours, SI sessions, eReserves)
4. Treat the instructor and peers with respect.
5. Ask questions. Asking questions is a sign of maturity, not ignorance, as long as the student thinks clearly before asking.
6. Understand that the instructor is not trying to "nit pick" when grading and remember that grading is the responsibility of the instructor. Accuracy is important in this class!

* The **instructor** has the following responsibilities:

1. Come prepared to every class.
2. Design each class so students can accomplish the cognitive objectives listed in the syllabus.
3. Provide appropriate tips for studying and study materials as seem appropriate.
4. Create a mutually respectful classroom environment.
5. Return tests and quizzes in a timely manner so that students will know their grade.
6. Grading, as far as possible, to be consistent and impersonal even though students might not agree with the decisions concerning partial credit.

Class Attendance: The student is responsible for the course material discussed in class; therefore the student is expected to attend all classes. Students who attend class on a regular basis have higher averages than those who elect to be absent occasionally. An inordinate number of absences will be handled in accordance with the College's policies and reported to the appropriate academic personnel. Students should make every effort to attend class on days in which quizzes are given out, see section on Quizzes below.

Homework: Homework assignments are for the student's benefit and will not be collected. It is important, however, that the student thoughtfully complete most of the problems assigned. The student will need to spend at least 10 good hours of study each week, not counting time spent taking quizzes, reviewing for tests, and preparing the graphing portfolio.

Students should keep current. Cramming for calculus tests will not result in the best grade or the needed retention of material. This course builds on previous work. Students should get at least 6 hours of good rest prior to taking a calculus test; otherwise the law of diminishing returns kicks in, students will lose more than they retain.

Calculators: Calculators will not be needed or allowed on tests or quizzes.

Gateway Exam: In order to pass this course, the student must pass an examination on derivatives. All 50 points will be given for a perfect paper. There will be four opportunities for the student to earn all 50 points. If the student has only ONE mistake, the student may choose to get a score of 35 points and not retest. More than ONE mistake is not considered a passing grade. Students making at least 35 on Gateway Exam 1 will receive a bonus of 20 points; students making at least 35 on Gateway Exam 2 will receive a bonus of 10 points. Each student needs to take each exam until the student passes. Students may re-test, even if the student has earned bonus points. The bonus points will remain. Passing the Gateway Exam is a requirement for passing this course (Goal 4 above).

An example Gateway Exam will be provided prior to the first testing day. The Gateway Exam will be given on the following mornings: Tuesday, **September 27**; Tuesday, **October 19**; Tuesday, **November 8**; Thursday, **November 17**.

Quizzes: All quizzes are announced and "take home." A student must be present in class to receive a quiz. Students must complete quizzes during one sitting and use only authorized materials (pencil, paper, and any reference material specifically authorized for a given quiz). Quizzes are due at class time on the class day following their assignment. If you are not in class when a quiz is given out, you generally cannot receive a copy of the quiz; however, exceptions to this policy are sometimes permitted on an emergency basis.

Each quiz will be graded on a basis of 25 points although some may contain bonus points. Twelve quizzes will be given and the best seven will be used as part of the grade determination for this course. The attached daily topics schedule provides the schedule for quizzes.

Major Tests: Four tests will be given as follows: Test 1 on Friday, **September 30** at 3:00; Test 2 on Friday, **October 28** at 3:00; Test 3 on Friday, **December 9** at 3:00; Test 4 on Tuesday, **December 13** at 8:00 am.

Students are expected to take tests at the scheduled times. Conflicts, problems and emergencies will be handled on an individual basis. For reasons deemed legitimate by your professor, arrangements may be made for a student to take a test prior to the testing time. Any student who needs special accommodations must provide documentation several days in advance of the needed accommodation so that appropriate arrangements may be made.

Graphing Portfolio: You are to use software (GRAPHMATICA) available in the computer labs to prepare a portfolio of computer-generated graphs. The portfolio is to contain at least 12 distinctly different displays of graphs. Each function is to be clearly identified by the formula. Use only algebraic, trigonometric (including inverse trigonometric), logarithmic and exponential functions or combinations of them.

The student must have at least three graphical displays where the important features of the graphs are clearly labeled (maximum, minimum, inflection points, etc.) The Curve Sketching Checklist (provided during the graphing section of this course and on eReserves) should be used to determine what graphing aspects should be labeled. These are the **technical graphs**.

The remaining graphs, at least nine graphical displays, should be linked by a theme and should combine several functions to make picture displays. These are the **thematic graphs**.

Students may receive help with the use of the computer and software, but students must choose their own functions and create their own printouts and portfolio.

In the past, students have indicated that 40 to 60 hours are needed to complete this project; therefore each student should plan ahead!

Evaluation of the portfolio will be made on the selection of graphs, the documentation associated with the graphs, the completeness of the technical graphs, the creativity of the thematic graphs, and the oral presentation of the portfolio. Accuracy, clarity, organization and originality are important in the finished product.

This assignment is due on Monday, **November 14** at class time. Oral presentations will be given on Monday, November 14 and, if needed, on Wednesday, November 16.

Grading: The student's final course grade will be determined as follows:

Major tests (4 @ 150 points)	600 points
Quizzes (7 out of 11, as noted above)	175 points
Graphing Portfolio	175 points
Gateway Test	<u>50</u> points
TOTAL	1000 points

In general, letter grades will be determined as follows, based on points each student earns:

- A: 900 or more points
- B: 800-899 points
- C: 700-799 points
- D: 600-699 points
- F: fewer than 600 points

Grades of A-, B+, B-, C+, C-, D+ may be assigned for sums of points near the above cut-off totals. For example, a B+ could be assigned for a sum of 888 points. Ultimately, the assignment of plus and minus is dependent on the overall class distribution of sums of points.

Outside Help: Students are encouraged to use the following:

Office hours will be posted weekly on the class conference. Students should use this time to come by and ask specific questions related to this course. In addition, students may email, either privately or on the class conference.

There is a class conference, Math 111 fall 2005. Students should have the class conference on their desktops and should consult this conference frequently for announcements about office hours, SI sessions, tutoring, outlines for tests, posting of grade distributions, etc. Students may pose individual questions on the class conference.

There are SI leaders for Math 111. Our SI student leaders will schedule review sessions each week, the topic for which will be posted on the class conference. Each student is encouraged to pick at least one of the times per week and attend regularly. Even though these sessions are optional, students who attend SI sessions generally do better in the courses for which there are SI leaders. Student tutors are available in the Gregory Room (schedule to be posted as soon as it is finalized). Study groups organized by students are highly recommended. The meetings should be scheduled weekly and should be part of a regular weekly routine.

e-Reserves are available through the library. Each student needs to have these prior to when they will be needed for the class. These handouts provide additional problems and explanations to the material being studied.

Organizational Guidelines for students:

(1) As soon as you get your syllabi from your courses, put all important dates on a single calendar, clearly labeled.

(2) Stay current in your subjects by setting aside 8 to 9 hours per week to study each subject. You may need more time in some subjects. Spread your per-subject time out over the week. Marathon studying, especially in mathematics, does not work well! So, make a schedule and keep to it! Be flexible enough to make changes in your schedule but don't schedule marathon studying.

(3) Plan ahead so that you get enough sleep before a test or you will not be able to think clearly and logically.

(4) Take advantage of the available outside help for each of your courses. Schedule at least one SI session per week for this course.

(5) Plan ahead for all your papers and projects so that studying for tests is not compromised. Create and schedule mini-goals to attain the major goal of completion on time.

(6) Have needed supplies for each course. Make sure you get copies of the e-Reserves PRIOR to the topic for which they are needed.

(7) Follow each syllabus carefully. For Math 111, your homework is listed for each class meeting. Reading the section before coming to class will help your understanding.

Summary of Important Dates:

September 5	Labor Day
September 27	Gateway Exam 1 at 8:30
September 30	Test 1 at 3:00
October 7	No Class
October 10, 11	Mid-semester break
October 18	Gateway Exam 2 at 8:30
October 28	Test 2 at 3:00
November 8	Gateway Exam 3 at 8:30
November 14	Graphing Portfolio Due/ Oral Presentations in class
November 17	Last Gateway Exam at 8:30
November 23-25	Thanksgiving Break
December 9	Test 3 at 3:00
December 12	Last Class Day
December 13	Test 4 at 7:45 am

Written Style: Neatness is one way of showing courtesy toward your instructor and pride in your work. Thoughts in mathematics are expressed in sentences, such as " $1+1=2$ ". There is a subject " $1+1$ ", a verb "=", and a predicate " 2 ". Remember that "=" should not be treated as a comma",". The student should strive to be neat and to use mathematical symbols appropriately.

Notes to the serious student:

1. **How much to study:** Calculus, to some, is a hard subject. It may be your most challenging course this semester. You should spend around 10 hours a week studying calculus, even if you have "seen it before." Don't assume you know the material! Extra time is needed to complete quizzes and the graphing portfolio. If you cannot make this level of time commitment this semester you will likely be better off taking calculus at another time.

2. **How to study:** Students often find calculus texts hard to read. They are not to be read like a novel, or a history or even a biology text. Your text is a reference book and should be read in a series of passes. The first pass through a section, done **before** the class for which the topics will be studied, you should skim through it lightly, reading definition and theorems, and trying to **work** through some of the examples. After class, re-read the text, your notes and/or e-Reserves. Don't expect to understand fully much of what you've read until you start working on the exercises. In fact, you should spend most of your study time working problems, thinking about those problems, and discussing problems. As you get stuck, go back, rereading the text or your notes or the e-Reserves, studying the examples and derivations, on a "need-to-know" basis.

3. **Homework:** Work lots and lots of problems. When you finish the current section, go back and work review problems. Furthermore, you have not completed the homework just because you have the right answers, you must understand **why** your methods worked. If all you are doing is blindly applying formulas and mimicking examples, get extra help. The problems should make logical sense to you. You must get to the point where you are able to work problems correctly, from start to finish, without having "to flip" back to the answer or to previous work. Time to reflect on your work helps build confidence and speed and enables you to retain the material.

4. **Studying for tests:** If you were an athlete preparing for track meet, and you slacked off during the weeks before the meet, doing just what you needed so coach wouldn't get on your case, and then stayed up running the whole night before your meet, you'd loose. Many students prepare for tests by cramming; they procrastinate and then believe that they can "stuff in" what they need for success by staying up all night attempting to study. Your brain will not to be in top shape by marathon studying. The right way to study is to do your work at a steady pace throughout the semester. There are a few facts and formulas you'll need to remember for a test. Make note cards for those facts and formulas and "touch base" with them often. In order to think well, you need to rest sufficiently and exercise adequately. Remember that aerobic exercise circulates blood to the body and that includes the brain.

5. **Come to class and use your outside help:** Many college students treat class attendance as optional. This may be fine for some classes; however, for calculus you can get way behind very fast. You should come to class every period unless you are seriously ill. Schedule at least one SI session per week. Stop by and see your instructor during office hours to ask pertinent questions. Take charge of your learning!

THE HONOR CODE OF OXFORD COLLEGE APPLIES TO ALL WORK SUBMITTED FOR CREDIT IN THIS COURSE. BY YOUR SIGNATURE ON SUCH WORK, YOU PLEDGE THAT WORK WAS DONE IN ACCORDANCE WITH THE RULES STIPULATED ON THE WORK OR IN THIS SYLLABUS!

TOPICS/HOMEWORK BY DAY
Mathematics 111, fall semester, 2005

NOTES: All tests will be in Seney 208 and 209. Handouts are on e-Reserves. See the class conference for a listing of the handouts as they are available. Bring your copy of the handouts to class.

Wednesday, August 31

and

Friday, September 2

Review of Functions [P]; Introduction to Calculus [1.1]; Limits [1.2]

p. 8: 1-4, 37, 41, 47, 49, 51, 53
 p. 16: 1, 3, 7, 9, 15, 19, 23, 31, 35, 39
 p. 27: 1, 7, 13, 15, 29, 51
 p. 43: 1, 3, 5, 7, 47, 53, 57, 59, 91, 95, 107
 p. 52: 1, 3, 5, 7, 9, 13, 19, 21, 25, 27, 39, 41, 49, 51, 53, 63, 67, 71, 75, 77
 p. 54: 1, 7, 13, 17, 19, 21, 25, 34, 35, 36, 51, 53, 57, 59, 61, 63
 p. 56: 1, 5, 7, 9
 p. 72: 11, 13, 15, 17

Labor Day Holiday – Monday, September 5

Wednesday, September 7

Limits [1.3]

p. 83: 5-43 odd, 51-61 (odd)

Friday, September 9

Continuity [1.4]

p. 94: 1-19 (odd), 25-27 (odd), 63, 65

Monday, September 12

**Intermediate Value Theorem [1.4];
 [Infinite limits [1.6] later in course]**

p. 96: 91-94 (all)
 p. 106: 7-10 (all), 15-26 (all), 44-57 (all)
 p. 108: 4, 5, 6, 9

Quiz 1

Wednesday, September 14

Definition of Derivative, Tangent Line Problem, Differentiability [2.1]

p. 20: 5-23 (odd), 33, 35, 39-42 (all), 47, 71-86 (all)

Friday, September 16

Basic Rules of Differentiation (the constant-multiple, sum, and difference rules; derivatives of powers, transcendental functions)

p. 132: 3-23 (odd), 39-51 (odd), 57-61 (odd), 91-94 (all), 101, 102, 109, 111

Monday, September 19**Product and Quotient Rules, Higher Order Derivatives [2.3]**

p. 143: 3,4,5-15 (odd), 23-53 (odd), 69, 71, 73, 75, 83-93 (odd), 103, 105

Quiz 2Wednesday, September 21**Chain Rule [2.4]**

p. 156: 9-35 (odd), 47-54 all, 55-93 (odd), 101-106 (all), 149, 151

Friday, September 23**Review of Differentiation**

p. 190: 1-10, 17-32, 37, 41-57, 59-62, 67-96, 97-114.

Quiz 3Monday, September 26**Implicit Differentiation [2.5]; Derivatives of Arcsine and Arctangent functions [2.6]**

p. 166: 1-38 (all), 41-46 (all), 65-68 (all), 75, 76

p. 171: 13, 14, 17, 18, 19, 20, 22, 31, 33, 34, 35, 40

Tuesday, September 27**Gateway Exam 1 at 8:30**Wednesday, September 28**Review**Friday, September 30**Test 1 at 3:00**

Monday, October 3

and

Wednesday, October 5**Related Rates [2.7]**

p. 180: 1-4 (all), 9, 10, 15, 18, 19, 20, 21, 22, 23, 24, 27, 28, 30, 31, 32, 33, 34, 35, 36, 39, 43

p. 191: 119-130(all) no calculators, 137, 138, 141, 144, 147, 148

p. 194: 4, 9

Quizzes 4 & 5 (due on Wednesday, October 12)Friday, October 7

No Class. . . keep working on differentiation and Related Rate Problems.

Mid-Semester Break - Monday, October 10

Wednesday, October 12**Extrema on an Interval [3.1]****Mean Value Theorem [3.2]**

p. 203: 7-10, 11-38 (odd), 59-62, 66

p. 210: 7-21 (odd), 35-43 (odd), 53, 54

Friday, October 14**Graphing Concepts [3.3, 3.4] with Application to Polynomial Functions**

Graphing handout

Monday, October 17

Graphing Handout
Quiz 6

**Infinite Limits [1.6]
Limits at Infinity [3.5]**

Tuesday, October 18

Gateway Exam 2 at 8:30

Wednesday, October 19

Graphing handout

Graphing Rational Functions [3.6]

Friday, October 21

Graphing handout
Quiz 7

**Graphs with Vertical Tangents, Other Types
of Graphs [3.6]**

Monday, October 24

Review Differentiation and Graphing

Wednesday, October 26

Review

Friday, October 28

Test 2 at 3:00

Monday, October 31

and

Wednesday, November 2

Optimization [3.7]

p. 256: 2-10 (all), 17, 18, 19, 23, 24, 26, 27, 29, 33, 37, 38, 43

p. 271: 80, 81

Friday, November 2

Antiderivatives [4.1]

p. 283: 15-44 (odd), 73-79 (all), 87

Quiz 8

Monday, November 7

**Sums and Sigma Notation [4.2]
Induction**

p. 295: 7-14 (all)

Induction handout

Tuesday, November 8

Gateway Exam 3 at 8:30

Wednesday, November 9

Quiz 9

Induction continued...

Friday, November 11

**Definite Integral, Area [4.3]
Fundamental Theorem of Calculus [4.4]**

p. 306: 3, 5, 7, 15, 17, 19, 23-28, 31, 32, 33, 35, 37, 39

p. 318: 5-37 (odd), 41-49 (odd), 85-109 (odd), 139, 140, 141

Monday, November 14

Graphing Portfolios due/ presentations

Wednesday, November 16

Integration by Substitution [4.5]

p. 331: 7-38 (odd), 45-75 (odd)

Thursday, November 17

Last Gateway Exam, Exam 4 at 8:30

Friday, November 18

More Substitution [4.7, 4.8]

p. 348: 1-35 (odd)

p. 355: 1-43 (odd)

Monday, November 21

**Introduction to Differential Equations
Separation of Variables [5.1, 5.2]**

p. 379: 1-9 (all)

p. 392: 1-6 (all), 33-68 (odd)

p. 367: 3-11 (odd), 21, 37-51 (odd), 63-79 (all), 97-114 (all)

Quiz 10

Thanksgiving Break - November 23-25

Monday, November 28

Area Between Curves [6.1]

p. 418: 1-6 (all), 15-30 (odd), 41, 43, 45

Wednesday, November 30

Volumes of Revolution - Disk Method [6.2]

p. 428: 1-22 (all), 23-32 (odd)

Friday, December 2

Volumes of Revolution - Shell Method [6.3]

p. 437: 1-20 (all)

p. 476: 1-10 (all), 21-28 (all)

Monday, December 5

Quizzes 11 and 12

Review of Area and Volume

Wednesday, December 7

Review

Friday, December 9

Test 3 at 3:00

Monday, December 12

Evaluation/ Review

Tuesday, December 13

Test 4 at 7:45 am