**Mathematics 110B**
**Spring, 2003**

**Textbook**: Larson, Hostetler and Edwards, Calculus of a Single Variable: Early Transcendental Functions, D.C. Heath and Company, 3rd edition

**Instructor**: Dr. Evelyn C. Bailey or Dr. Fang Chen

**Course Content**: A two-semester course, Mathematics 110A, B provides students with an integrative approach to calculus that includes the necessary precalculus topics. 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; integration by substitution; and applications of the definite integral. Algebraic and transcendental functions are included. Math 110A does not count for a GER mathematics course. Math 110B does count for a GER mathematics course.

**Content for Math 110A**

Review of algebra, functions, trigonometric functions, logarithms and exponents. Calculus topics include limits, continuity, definition of derivative, differentiation, extrema, Intermediate Value Theorem, Mean Value Theorem, graphing polynomial and rational functions, optimization problems.

**Content for Math 110B**

Review of inverse trigonometric functions and differentiation, and graphing. New topics include implicit differentiation, logarithmic differentiation, related rates, graphing vertical tangents, sums and sigma notation, induction, antiderivatives, Fundamental Theorem of Calculus, definite integral, area, volume, separable differential equations, substitution method of integration.

**Goals**: By the completion of the sequence Math110A and 110B, the student should have a basic conceptual understanding of the following: (1) limits and their relationship to the graph of a function, (2) the derivative and its relationship to the graph of a function and to the concept of "rate of change," and (3) the definite integral and its relationship to area and volume. The student should be able to calculate derivatives and to evaluate limits and integrals (both definite and indefinite). The sequential course for Math 110B is Math 112, Calculus II.

**Class Attendance**: The student is responsible for the course material discussed in class, therefore the student is expected to attend all classes. An inordinate number of absences will be handled in accordance with the College's policies.

**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.

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

**Gateway Exam**: In order to pass this course, the student must pass an examination on differentiation. All 100 points will be given for a perfect paper. If the student has only ONE mistake, the student may choose to get a score of 80 points and not retest. More than ONE

mistake is not considered a passing grade. The Gateway Tests are scheduled in the class calendar. Attached is an outline of the Gateway Exam.

**Major Tests**: Five tests will be given at 8:00 a.m. as follows: Test 1 on Tuesday, **February 4**; Test 2 on Thursday, **February 20**; Test 3 on Thursday, **March 6**; Test 4 on Tuesday, **April 1**; and Test 5 on Thursday, **April 17**. 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 provided documentation several days in advance of the needed accommodation so that appropriate arrangements may be made.

**Graphing Portfolio:** Students 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 15 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) should be used to determine what graphing aspects should be labeled. These are the technical graphs. The remaining graphs should be linked by a theme and should combine several functions to make picture displays. These are the thematic graphs.

Workers in the computer lab may help with the use of the computer and software, but students must choose their own functions and create their own printouts and portfolios. Evaluation of the portfolio will be based 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, neatness and originality are important in the finished product. This assignment is due on Monday, **April 21** at class time. Oral presentations will be given on Monday, April 21 and, if needed, on Wednesday, April 23. Students should not wait until the end of the semester to do this project. Use your time wisely throughout the semester.

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

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| Gateway Exam @ 100 pts | 100 points |
| Major tests (5 @ 100 points) | 500 points |
| Graphing Portfolio | 150 points |
| Final Exam (Comprehensive) | 250 points |
| | 1000 points |

In general, letter grades will be determined as follows:

A: 900 or more points
B: 800 – 899
C: 700 – 799
D: 600 – 699
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 scores in total points.

**Scheduled Help Outside Class**: Maica Kozak, Corey Orton and Kunal Sharma are SI leaders for Math 110B this semester. They will schedule outside of class study sessions for students.

In addition, student tutors are available to help with homework problems. A schedule of tutoring hours will be provided early in the semester.

**e-Reserves/WebSite:** The student is responsible for obtaining the handouts on library e-Reserves. Handouts include information and exercises to supplement the textbook.

In addition, there is a Graphing Tutorial at the following web site (also accessible through e-Reserve):
http://www.oxford.emory.edu/OXFORD/RESTRICTED/UNIVERSITY/Classes/Chen/Calculus/Index.htm

**Learnlink**: There is a class conference on Learnlink, Math 110B. Announcements from your SI leaders and from your instructors will be posted. Students may ask questions and make requests of a general nature on this conference. Individual concerns should be sent directly to your professor.

**Summary of Important Dates**:

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| January 15 | Gateway Pre-Test in class |
| January 20 | Martin Luther King Holiday |
| January 30 | Gateway Test 1 at 8:30 a.m. |
| February 4 | Test 1 at 8 a.m. |
| February 13 | Gateway Test 2 at 8:30 a.m. |
| February 20 | Test 2 at 8 a.m. |
| March 6 | Test 3 at 8 a.m. |
| March 7 | Gateway Test 3 in class |
| March 10 – 14 | Spring Break |
| March 25 | Gateway Test 4 at 8:30 a.m. |
| April 1 | Test 4 at 8 a.m. |
| April 8 | Gateway Test 5 at 8:30 a.m. |
| April 17 | Test 5 at 8 a.m. |
| April 18 | Good Friday (no class) |
| April 21 | Graphing Portfolio Due |
| April 21, 23 | Graphing Portfolio Presentations |
| April 24 | Gateway Test 6 at 8:30 a.m. |
| April 28 | Last Class Day |
| April 30 | Reading Day, any make up Gateway Test with permission |

**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". The student should strive to be neat and to use mathematical symbols appropriately.

**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.**

# Math 110B
# Spring, 2003

## Class Calendar

Wednesday, January 15 — Introduction and Gateway Pre-Test

Friday, January 17 — Review Differentiation
(e-Reserve: Review Differentiation)
Textbook: p. 143 37-54 (odd); p. 156 9-36(odd), 55-92(odd)

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Monday, January 20 — Martin Luther King Holiday - No Class

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Wednesday, January 22 — Implicit Differentiation
Textbook: p. 166 1-20(odd); 25-38; 41-46(odd); 49-50
(e-Reserve: Implicit Differentiation)

Friday, January 24 — Logarithmic Differentiation
Textbook: p. 167 55-64

Monday, January 27 — Inverse Trigonometric Functions
(e-Reserve: Notes on Transcendental Functions Section E)

Wednesday, January 29 — Limits and Derivatives of Transcendental Functions
Textbook: p. 173 13-38(odd)
(e-Reserve: More on Transcendental Functions)

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Thursday, January 30 — Gateway Test 1 at 8:30 a.m.

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Friday, January 31 — Review
(e-Reserve: Review Differentiation #2)
(e-Reserve: Review for Test 1)

Monday, February 3 — Review

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Tuesday, February 4 — Test 1 at 8:00 a.m.

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Wednesday, February 5 — Discuss Graphing Portfolios

Friday, February 7 — Review Graphing
(e-Reserve: Graphing Handout – Vertical Tangents)
(e-Reserve: Calculus Page – Graphing Tutorial)

Monday, February 10 — Graphs with Vertical Tangents
Wednesday, February 12 (e-Reserve: Calculus Page – Graphing Tutorial – Vertical Tangent)
Textbook: p. 270 51-64

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Thursday, February 13 — Gateway Test 2 at 8:30 a.m.

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Friday, February 14 — Sums and Sigma Notation
Textbook: p. 295 1-6, 7-14(odd), 15-20

Monday, February 17 — Mathematical Induction
(e-Reserve: Mathematical Induction)

Wednesday, February 19 — Review for Test 2
(e-Reserve: Review for Test 2)

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Thursday, February 20 — Test 2 at 8:00 a.m.

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Friday, February 21
Monday, February 24 — Antiderivatives, Definite Integrals, Fundamental Theorem of Calculus, Area under the Curve
(e-Reserve: Area and Fundamental Theorem of Calculus)
Textbook: p. 283 15-44; p. 306 15-22, 23-44(odd), 45; p. 318 5-38(odd), 41-50(odd)

Wednesday, February 26 — Acceleration, Velocity, Speed
(e-Reserve: Acceleration, Velocity, Speed)
Textbook: p. 285 73-87(odd)

Friday, February 28 — Review
(e-Reserve: Review for Test 3)

Monday, March 3 — Review

Wednesday, March 5 — Review

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Thursday, March 6 — Test 3 at 8:00 a.m.

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Friday, March 7 — Gateway Test 3 in class

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March 10 – 14 — Spring Break

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Monday, March 17 — Related Rates
Wednesday, March 19 (e-Reserve: Application: Related Rates)
Textbook: p. 180 15-36, 51

Friday, March 21 — Substitution Method
Monday, March 24 (e-Reserve: Further Exercises on Substitution)
(e-Reserve: Reference Sheet)
Textbook: p. 331 7-34(odd), 45-76(odd), 85-92, 93-110(odd); p. 348 1-32; p. 355 1-30(odd)

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Tuesday, March 25 — Gateway Test 4 at 8:30 a.m.

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Wednesday, March 26 — Mean Value Theorem for Integrals
First Order Separable Differential Equations
(e-Reserve: Mean Value Theorem for Integrals and First Order Separable Differential Equations)
Textbook: p. 318 51-62; p. 392 33-58(odd)

Friday, March 28 — Review
(e-Reserve: Review for Test 4)

Monday, March 31 — Review

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Tuesday, April 1 — Test 4 at 8:00 a.m.

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Wednesday, April 2 — Area Between Curves
Friday, April 4 (e-Reserve: Area and Volume Examples)
Textbook: p. 418 7-12(odd), 15-30

Monday, April 7 — Volume of Solid Revolutions
Wednesday, April 9 (e-Reserve: Area and Volume Examples)
Friday, April 11 (e-Reserve: Calculus Page – Graphing Tutorial – Volume Section)
Textbook: p. 429 11-32; p. 437 5-21

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Tuesday, April 8 — Gateway Test 5 at 8:30 a.m.

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Monday, April 14 — Review
Wednesday, April 16 (e-Reserve: Review for Test 5)

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Thursday, April 17 — Test 5 at 8:00 a.m.

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Friday, April 18 — Good Friday – No Class

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| Monday, April 21 | Graphing Portfolio Due – Oral Presentations |
| Wednesday, April 23 | Graphing Portfolio Oral Presentations |

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| Thursday, April 24 | Gateway Test 6 at 8:30 a.m. – LAST ONE! |

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| Friday, April 25 | Review for Final |

(e-Reserve: Review for Final)

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| Monday, April 28 | Review for Final |

Wednesday, April 30 is Reading Day

The Final Exam will be given according to the exam schedule.

## Outline of the Gateway Test

The test will consist of finding the derivative of the following kinds of functions:

- a linear combination of simple functions (e.g. $3x^7 - 4x + \frac{2}{x^3} - \frac{\sqrt{x}}{3} + \sqrt{2}$, etc.)
- a simple product (e.g. $x \sec x$, $e^x \cos x$, etc.)
- a simple quotient (e.g. $\frac{\sin x}{x}$, $\frac{\tan x}{x^2+1}$, etc.)
- a simple composition (e.g. $e^{x^2}$, $\sin\sqrt{x}$, $\cot 2x^3$, etc.)
- a rational function (e.g. $\frac{x^2-4}{x^2+4}$, $\frac{x}{(3x-1)^3}$, etc.)
- an algebraic function (e.g. $x(2-x)^{1/3}$, $(4-x^2)^{2/3}$, $x/\sqrt{x^2+1}$, etc.)
- a multiple composition (e.g. $\cos\left(\sin^2\left(x^2\right)\right)$, $\sqrt{\csc e^{2x}}$, etc.)
- a combination of product, quotient, and/or composition (e.g. $e^{x^2}\sin\sqrt{x}$, $\frac{x\tan x}{1+x^2}$, $\frac{1+\sin^2 2x}{1+\cos^2 2x}$, $\sqrt{\frac{1+\sqrt{x}}{1-\sqrt{x}}}$, etc.)

One problem will ask you to find the first and the second derivatives of either a rational or an algebraic function.

- One or two of the functions will contain literal constants (e.g. $\frac{x}{x^2+a^2}$, $\sin kx$, $e^{x^2-c^2}$, etc.).

Most or all of the basic functions will appear in the test.

Some derivative will have to be simplified, but not most. The simplified form is not to contain negative exponents.

## Calculus Survival Guide

1. **How much to study:** Calculus is a hard subject. It is likely that it will be your most challenging course this semester. You should be spending **10** to **15** hours a week studying calculus. If you need to make adjustments in your academic or work schedules, do so now. 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:** Calculus texts are odd books. They are not meant to be read like a novel, or even like a history or biology text. Your calculus should be read in a series of passes. On the first pass through a section, which should be done **before** the lecturer covers it, the student should skim through it lightly, reading definitions and theorems, and trying to **work** through some of the examples. But, and this is the key, you won't fully understand much of what you've read until you start working on the exercises. In fact, you should spend most, perhaps **80%**, of your study time working problems. As you get stuck, you go back, rereading the section, studying the examples and derivations, on a "need-to-know" basis.

3. **Homework:** Work lots and lots of problems, not just the ones assigned as homework. If you are done with the current section, go back and work review problems. Furthermore, you are not done with a problem just because you got the right answer. You are only done when you understand **why** the methods you used had to have worked. If all you are doing is blindly applying formulas and mimicking examples, get extra help. The problems should make *sense* to you.

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 the coach wouldn't get on your case, and then stayed up running the whole night before you meet, you'd lose. Yet this is just how many students prepare for exams. The right way to study for a test, is to do your work at a steady pace throughout the semester. The point is, that while there are a few facts and formulas you'll need to remember for a test, the real way to do well is to think well. That is, you want your brain to be in top shape. You cannot achieve that by cramming. It is now known that as you learn the brain slowly rewires itself. As you study, you *gradually* get smarter. That is the whole point of college!

5. **Come to class:** 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.