Mathematics 112

Spring, 1997

Textbook: Varberg and Purcell, Calculus, 6th Edition

Instructor: William P. McKibben
Office: Seney 303
Phone: 4-8333

Regular Office Hours:
Mondays: 4:00 - 5:00 p.m.
Tuesdays: 9:45 - 10:45 a.m.; 1:30 - 2:30 p.m.
Wednesdays: 2:30 - 3:30 p.m.
Thursdays: 4:30 - 5:30 p.m.

Course Content: Math 112 is the second semester of calculus. Course content includes differentiation of logarithmic, exponential and inverse trigonometric functions; methods of integration; L'Hospital's Rule; improper integrals; polar coordinates; sequences and infinite series; and power series. A list of specific topics by day is given below.

Goals: Students should have a basic understanding of derivative, of antiderivative and of limit (from Math 111). Students should be able to use the rules of differentiation as they apply to algebraic and transcendental functions; to evaluate a variety of limits involving these functions; to sketch graphs of transcendental functions by building on concepts from Math 111; to demonstrate methods of integration (substitution, parts, trigonometric substitution, and partial fractions) and use these methods with typical indefinite, definite and improper integrals; to graph and find areas related to polar coordinate functions; to investigate and determine convergence or divergence of elementary infinite series of constants and to give logical arguments for conclusions; to determine the domain of convergence of basic power series; to derive a power series expression for certain algebraic and transcendental functions by using related geometric series or Taylor's Theorem; to use computer technology to produce graphs of functions based on functions typically studied in this course; to solve simple first-order differential equations.

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 complete thoughtfully most of the problems assigned. The student will need to spend at least 6 good hours of study each week, not counting time spent taking quizzes, reviewing for tests, working on the paper and preparing the graphing portfolio.

Quizzes: All quizzes are announced and "take home." A student must be present in class to receive a quiz. Quizzes must be done during one sitting and use only the reference sheet provided for the course. Calculators may be used on quizzes. Quizzes are due at class time on the class day following. Each quiz will be graded on a basis of 25 points, and the best eight quizzes will be used to help determine the final course grade.

Major Tests: Four tests will be given as follows:

Test 1: Thursday, February 6 at 7:45 a.m.
Test 2: Thursday, February 27 at 7:45 a.m.
Test 3: Tuesday, April 1 at 7:45 a.m.
Test 4: Thursday, April 17 at 7:45 a.m.

Students are expected to take tests at the scheduled times. Any conflicts or problems will be handled on an individual basis. For reasons deemed legitimate by your professor, arrangements may be made for a student to take at test prior to the testing time. Emergencies will be handled on an individual basis. *Unless otherwise stated, calculators are not permitted on tests.*

Graphing Portfolio: You are to use the program DERIVE in the IBM computer lab (Pierce 122) to prepare a portfolio of computer-generated graphs. The portfolio is to contain at least eight but not more than fifteen distinctly different graphs. The function involved in each graph is to be clearly identified by formula. At least four of the graphs are to be those of polar functions; at least four are to be in rectangular coordinates with functions of the form y=f(x) and must include algebraic, inverse trigonometric, logarithmic and exponential functions and combinations thereof. At least three graphs should be used to illustrate the important features of graphs studied in Math 111 (horizontal and vertical tangents, points of inflection, horizontal and vertical asymptotes). Student workers in the computer lab may help with the use of the computer and software, but you must choose your own functions and create your own printouts and portfolio. Accuracy, clarty, organization and originality are important in your finished product. This assignment is due on Monday, April 7 at class time

Research Paper: You are to write a paper of from four (4) to six (6) typed pages, double-spaced. You are expected to use and reference at least seven (7) sources. The references used should be listed at the end of your paper and referenced appropriately with respect to quotes, facts, etc. Your use of references will have a part in determining your grade on this assignment. The Honor Code of Oxford College applies to this assignment.

Your paper is to support or refute **one** of the following statements:

A. The solution of a Hilbert Problem is important to the progress of mathematics.
Notes: (1) The mathematician David Hilbert presented some problems to the mathematical community in 1900. (2) The Hilbert Problem associated with what is known as Fermat's Last Theorem was apparently solved during the summer of 1993.

B. A foundation for calculus was already in place before its formulation in the seventeenth century; in fact, the rudiments of calculus existed with the Alexandrian Greeks.
Note: Isaac Newton and Wilhelm Gottfried Leibniz are recognized as independent formulators of calculus.

C. Most "great" mathematicians have been cloistered specialists who cared little for other fields of human knowledge and endeavor.
Note: Most mathematical historians agree that the following have been the five greatest mathematicians: Archimedes, Newton, Euler, Gauss, and von Neumann.

The research paper is due on Friday, March 7 at class time

The following is a list of possible sources for you to begin your study:

Boyer and Merzbach, A History of Mathematics
Burt, Jones and Bedient, The Historical Roots of Elamentary Mathematics
Kline, Mathematical Thought from Ancient to Modern Times
Newman, The World of Mathematics (4 volume set)
Smith, History of Mathematics (2 volume set)

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

Major tests (4 @ 100 points)	400 points
Quizzes (best 8 @ 25 points)	200 points
Research Paper	100 points
Graphing Portfolio	100 points
Final Exam	200 points
	1000 points

In general, letter grades will be determined as follows:

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-offs in total points.

Supplemental Instruction and Tutoring: Becky Byers is the SI leader for this semester. She will schedule sessions for your benefit. Student tutors are available to help with homework problems. A schedule will be posted early in the semester. Use these additional oppotunities for help only at appointed times.

THE HONOR CODE OF OXFORD COLLEGE APPLIES TO ALL WORK SUBMITTED FOR CREDIT IN THIS COURSE. BY YOUR SIGNATURE ON SUCH WORK YOU PLEDGE THE WORK TO BE YOURS AND YOURS ALONE.

Math 112 Topics Calendar

Spring, 1997

Wednesday, January 15	7.1, H	Natural Logarithm Function, Inverses

p. 333: 3-25 (odd); 35, 37
Additional problems in handout

Friday, January 17	7.2 - 7.4, H	Inverses; Natural Exponential Function; Logarithmic Differentiation

p. 339: 1, 3, 5, 15, 17, 19
p. 346: 3-35 (odd)
p. 352: 1-7 (odd); 17-25 (odd); 29-33 (odd)

Wednesday, January 22	H	Review Limits

Handouts

Friday, January 24		Review graphing

p. 380: 1, 3, 5, 13, 15, 19, 21, 23, 38, 39
Exercises in handout
Quiz 1

Monday, January 27	7.6-7.7	Inverse Trigonometric Functions

p. 366: 1-9 (odd); 31, 33
p. 372: 1-39 (odd)
Exercises in handout

Wednesday, January 29	15.2, H	Partial Derivatives; Differentiation Review

p. 687: 1-15 (odd)
Handout with review problems
Quiz 2

Friday, January 31	8.1-8.2	Integration by Substitution

p. 388: 1-25 (odd); 29-55 (odd)
p. 395: 1-17 (odd); 23-29 (odd)
Review handout on u-substitution
Quiz 3

Monday, February 3 — Review

Review handout for Test 1

Wednesday, February 5 — Review

Thursday, February 6 — **Test 1 at 7:45 a.m.**

Friday, February 7 — 8.3, H — Trigonometric Substitution

p. 400: 1-29 (odd); 33 [Note: not all integrals here require trigonometric substitution]
Additional problems in handout

Monday, February 10 — Trigonometric substitution (continued)

complete assignment from Friday
Quiz 4

Wednesday, February 12 — 8.4, H — Integration by Parts

p. 407: 1-15 (odd); 19, 21, 23 [Note: for problems 21 and 23, do directly, without formula]
Additional problems in handout

Friday, February 14 — 8.5,H — Partial Fractions

p. 415: 1-21 (odd)
p. 416 ("Sample Test Problems"): 1-16; 18-24; 26-35; 37-42
Additional problems in handout
Quiz 5

Monday, February 17 — Partial Fractions (continued)

complete assignment from Friday
Quiz 6

Wednesday, February 19 — 9.1, 9.2, H — L'Hospital's Rule

p. 424: 1-21 (odd)
p. 430: 1-37 (odd)
Handout

Friday, February 21 — 9.3, 9.4, H — Improper Integrals

p. 436: 1-19 (odd)
p. 441: 1-15 (odd)
p. 443 ("Sample Test Problems"): 1-34
Additional problems in handout
Review handout
Quiz 7

Monday, February 24 — Improper Integrals (continued) Review

complete assignments from Friday

Wednesday, February 26 — Review

Thursday, February 27 — **Test 2 at 7:45 a.m.**

Friday, February 28 — 12.6, 12.7, H — Polar Coordinates

p. 577: 1, 3, 7, 9, 11, 13, 15, 23, 25, 27
p. 581: 3, 5, 9, 11, 13, 15, 21, 23, 25
Quiz 8

Monday, March 3 — 12.8,H — Areas with polar coordinates

p. 588: 3, 5, 11, 13, 15, 21
Handout problems

Wednesday, March 5 — Areas (continued)

complete assignment from Monday
Quiz 9

Friday, March 7 — 11.1,H — Sequences

Research Paper due

p. 489: 1-29 (odd)
Exercises in handout

Monday, March 17 — 11.2, H — Geometric and Telescoping Series

p. 497: 1-13 (odd); 23
Exercises, Part I in handout

Wednesday, March 19 — 11.3, H — The n^{th} term Test, Integral Test, p-series

p. 504: 1-21 (odd)
Handout 3.1

Friday, March 21 — The n^{th} term Test, Integral Test, p-series (continued)

complete assignment from Wednesday
Quiz 10

Monday, March 24 — 11.4, H — Comparison Test, Limit Comparison Test

p. 512: 1, 3, 11-19 (odd); 27, 29
Handout 3.2

Wednesday, March 26 — Comparison Test, Limit Comparison Test (continued)

complete assignment from Monday
Quiz 11

Friday, March 28 — Review

Review Handout

Monday, March 31 — Review

Tuesday, April 1 — **Test 3 at 7:45 a.m.**

Wednesday, April 2 — 11.4, 11.5, H — Alternating Series, Absolute Convergence, Ratio Test

p. 518: 7, 9, 11; 13-29 (odd)
p. 512: 5, 7, 9, 31, 33
Exercises, Part II in handout

Friday, April 4 — Review Infinite Series

Handout 4.1

Monday April 7 — 11.6, H — Power Series

Graphing Portfolio due

p. 523: 1-19 (odd)
Exercises, Part I in handout

Wednesday, April 9 — 11.7, H — Operations on Power Series

p. 529: 1-11 (odd)
Exercises, Part II in handout
Quiz 12

Friday, April 11 — 11.8, H — Taylor and Maclaurin Series

p. 540 ("Sample Test Problems"): 19-42
Handout 4.2
Review Handout

Monday, April 14 — Review

complete review problems assigned

Wednesday, April 16 — Review

Thursday, April 17 — **Test 4 at 7:45 a.m.**

Friday, April 18 — H — Review of First-Order Separable Differential Equations; Exact First-Order Differential Equations

Exercises I and II in handout
Quiz 13

Monday, April 21 — H — Linear First-Order Differential Equations

Exercises III in handout

Wednesday, April 23	Course Review
Review handout **Quiz 14**	
Friday, April 25	Course Review
Monday, April 28	Course Review

Final Examinations: **9:00 class : Wednesday, May 7, 8:30 - 12:00 in Seney 208**

10:00 class : Monday, May 5, 8:30 - 12:00 in Seney 208