MATH 1451, CALCULUS I

Fall Semester, 2014

Mathematics Department, Dr. Evelyn Potter, Department Chair

COURSE DESCRIPTION

Limits, continuity, differentiation and integration of elementary and transcendental functions, L'Hôpital's Rule. Applications, including rates of change, max/min problems, and area between curves. This course includes one semester hour credit for laboratory sessions.

COURSE SEQUENCE IN CURRICULUM

This course may be used to fulfill the mathematics requirement for Smith College. It may also be used to satisfy one of the requirements for a major for students majoring in Business, Biochemistry/Molecular Biology, Chemistry, Mathematics, Mathematical Studies, or Physics provided the student earns a grade of C or higher. It may be use by any student to demonstrate math proficiency **provided the student earns a grade of C or higher.**

PRE-REQUISITE INFORMATION

Prerequisites: MATH 1434 or a satisfactory score on a placement test.

INSTRUCTOR INFORMATION

Name:	Dr. Barbara Benitez
E-mail:	bbenitez@hbu.edu
Office Phone:	281-649-3050
Office Location:	N207
Office Hours:	Announced in class
Web Page Address, Web Board, ListServ:	Blackboard

LEARNING RESOURCES

Course Text:	*Calculus—Early Transcendentals*, 7th ed., by James Stewart, Brooks/Cole Publishing Company, 2012, ISBN 978-0-538-49790-9
Laboratory Text	None
Supplementary Text:	*Student Solutions Manual—Single Variable Early Transcendentals*, 7th ed. By Daniel Anderson, Jeffrey Cole, and Daniel Drucker, Brooks Cole Publishing Company, 2012, ISBN 0-8400-4934-X.
Other Required Materials:	WebAssign Access Card or number and a graphing calculator (preferably a TI-83 Plus or a TI-84 Plus). Note: A TI-89, TI-92 or another calculator which will do symbolic manipulations may be used on homework and lab assignments but may <u>not</u> be used on tests. Use of such a calculator is considered cheating and will result in a grade of 0 on that test. You should be prepared to clear the memory of any calculator used on a test. If your calculator contains programs or data which you want to keep, you should save the programs or data before the test or arrange to use a different calculator during the test. Calculators may be used during tests only to draw graphs, perform numerical calculations, and to check answers. Unless specifically stated otherwise, they may not be used during tests to solve problems by using calculus-related commands, such as computing derivatives and integrals.

COURSE OBJECTIVES

Purpose of the course:

This course is an introduction to the fundamental concepts of differential and integral calculus, including limits, continuity, and differentiation and integration of algebraic, trigonometric, inverse trigonometric, logarithmic, and exponential functions. Applications of differential and integral calculus are also covered, including tangent lines, velocity and acceleration, rates of change, max/min problems, concavity, Newton's Method, areas between curves, volumes of solids of revolution, work, and average value.

Aims for the course:

This course is intended to introduce students to the fundamental concepts of differential and integral calculus of algebraic and transcendental functions and to prepare them for more advanced courses in mathematics, engineering and science.

On completion of this course, students should be able to:

1. Understand the basic concepts of single-variable calculus, including limits, continuity, derivatives, differentials, and integrals.
2. Compute limits directly or by using L'Hospital's Rule.
3. Apply differentiation techniques such as the power rule, product rule, quotient rule, chain rule and implicit differentiation to find the derivatives of algebraic, trigonometric, inverse trigonometric, logarithmic, and exponential functions.
4. Perform simple integrations, both definite and indefinite including change of variables, involving algebraic, trigonometric, inverse trigonometric, logarithmic, and exponential functions.
5. Apply differentiation and integration techniques to solve problems involving tangent and normal lines, numerical approximations, rates of change, exponential growth and decay, maximization and minimization, area, volume, average value, work, velocity and acceleration, work, and volume.
6. Determine when a function is increasing, decreasing, concave up or concave down, find its local extrema and points of inflection, and be able to utilize this information to draw and interpret its graph.
7. Understand the principles embodied in such theorems as the Intermediate Value Theorem, Rolle's Theorem, the Mean Value Theorem, the Extreme Value Theorem, and the Fundamental Theorem of Calculus.

RELATION TO DEPARTMENTAL GOALS AND PURPOSES

The Mathematics/Physics Department "…will offer an academically rigorous, undergraduate curriculum in classical and modern mathematics. The curriculum will prepare students majoring in mathematics and mathematical studies for careers and further education in mathematics and will encourage a lifetime of learning."

"…will provide academically rigorous and modern courses in mathematics to support other programs at the University."

"…will offer courses to enable all graduates of the University to become mathematically literate and develop useful skills in mathematics."

"…will provide the appropriate administrative processes, facilities, research experiences, and faculty to achieve the goals stated above."

RELATION TO COLLEGE GOALS AND PURPOSES

"…to prepare students for careers and further education in the natural sciences and mathematics in a nurturing Christian environment. The College will also serve the HBU community by providing science and mathematics classes that empower HBU students to meet the goals and requirements of their field of study and enrich their liberal arts education."

RELATION TO THE PURPOSE STATEMENT OF THE UNIVERSITY

University mission and purpose statement from the Houston Baptist University Catalog, 2009-2010: "…to provide a learning experience that instills in students a passion for academic, spiritual, and professional excellence as a result of our central confession, "Jesus Christ is Lord"

"…Committed to providing a responsible and intellectually stimulating environment that:

- fosters spiritual maturity, strength of character, and moral virtue as the foundation for successful living
- develops professional behaviors and personal characteristics for life-long learning and service to God and to the community
- meets the changing needs of the community and society
- remains faithful to the **'Nature of the Institution'** statement"

"…Promotes learning, scholarship, creative endeavor, and service".

ATTENDANCE

Please see the official Attendance Policy in the HBU Classroom Policy on Blackboard. Students missing more than 25% of the class will be given a failing grade.

Penalty Points: In addition to the above university policy, in this class one penalty point off of the final average will be assessed for each unexcused absence after the third unexcused absence and/or one penalty point for each time a student is late after the fourth time. The maximum penalty that will be given is 10 points off of the final average.

ACADEMIC ACCOMODATIONS

Students needing learning accommodations should inform the professor immediately and consult the Academic Accommodations section of the HBU Classroom Policy posted on Blackboard.

COURSE REQUIREMENTS & GRADE SCALE

Course requirements:

Each student will take three exams in addition to a comprehensive final exam. Homework assigned from the textbook and will not be graded nor collected in class.

Grading standards:

Course grading is as follows:

Quizzes	100 points
Regular in class exams (3)	300 points
Final exam	200 points
	---
	600 points

The in class average is the total points earned divided by 6.

The grading scale is:

A = 90 – 100; B = 80 – 89; C = 70 – 79; D = 60 – 69; F = Below 60.

PROFICIENCIES:

Technology component:

None

Designated essay/writing component:

Some questions on examinations and homework assignments may require essay-type answers.

Reading component:

Students are required to read the textbook. They are responsible for all assigned material even if it is not covered in class.

Oral communication component:

Does not apply to this course.

Mathematics component:

Entire course.

Critical thinking component:

Students are required to read, understand and analyze problems, develop solution strategies, implement these strategies to solve the problems, then interpret and verify their results.

LATE WORK & TEST POLICY

Late work:

Does not apply.

Missed exams:

A grade of 0 will be assigned for any exam missed due to an unexcused absence. The grade on the final exam (rescaled to 100 points) will be used in place of the first exam missed because of an **excused** absence. A makeup exam will be given for any subsequent exam missed because of an **excused** absence. **All absences will be assumed to be unexcused unless written evidence, such as a note from an attending physician, is presented to demonstrate otherwise.**

EVALUATION

Method of student appraisal of faculty:

Students will be given an opportunity to appraise the professor by completing the IDEA Faculty Evaluation Questionnaire, and/or the COSM course evaluation at the end of

the semester. The instructor, the department chairman and dean will review the responses of the students after the completion of the course.

Method of evaluating student response to course:

Students will be given an opportunity to describe their response to the course by completing the IDEA Faculty Evaluation Questionnaire and/or the COSM course Evaluation at the end of the course. The instructor, the department chairman and dean will review the responses of the students after the completion of the course.

LABORATORY DRESS CODE

Students may be asked in advance to wear closed-toed shoes and long pants during certain experimental procedures.

Does not apply.

LABORATORY CONDUCT AND SAFETY

Not applicable.

TOPICAL OUTLINE - ***include table, calendar, or topical outline with dates***

Topics Covered:

Week	MONDAY	TUESDAY LAB	WEDNESDAY	THURSDAY LAB	FRIDAY
1 8-26	Course Introduction; §2.1 Tangent Lines	§2.1 Velocity Problems	§2.2 The Limit of a Function	**Computer Lab 1** Introduction to Maple; Slope of Tangent Lines; Instantaneous Velocity	§2.2 The Limit of a Function; Vertical Asymptotes
2 9-2	**Labor Day Holiday 9-3-13**	§2.3 Calculating Limits Using The Limit Laws	§2.3(cont.) Calculating Limits Using The Limit Laws—Techniques for Computing Limits	**Computer Lab 2** Computing Limits; Plotting Graphs; Tangent and Secant Lines	§2.4 The Precise Definition of the Limit of a Function
3 9-9	§2.5 Continuity and The Intermediate Value Theorem	§2.5 Continuity and The Intermediate Value Theorem (cont.)	§2.6 Limits at Infinity; Horizontal Asymptotes	**Computer Lab 3** Piecewise Defined Functions; Vertical and Horizontal Asymptotes	§2.6 Limits at Infinity; Horizontal Asymptotes (cont.)
4 9-16	§2.7 Derivatives and Rates of Change	§2.8 The Derivative as a Function	§3.1 Derivatives of Polynomials and Exponential Functions	**Computer Lab 4** Definition of the Derivative; Maple Differentiation Commands; Tangent and Normal Lines	§3.1 Derivatives of Polynomials and Exponential Functions (cont.)
5 9-23	§3.2 The Product and Quotient Rules	§3.2 The Extended Product Rule; §3.3 Derivatives	§3.3 Derivatives of Trigonometric Functions (cont.); Review	**Test 1 9-26-13**	§3.4 The Chain Rule

		of Trigonometric Functions	for Test 1 (time permitting)		
6 9-30	§3.4 The Chain Rule (cont.)	§3.5 Implicit Differentiation	§3.5 Implicit Differentiation (cont.) — Differentiation of Trig Functions	**Computer Lab 5** Differentiation of Trig Functions; Plotting Inverse Functions; Inverse Trig Functions; Implicit Differentiation	§3.6 Derivatives of Logarithmic Functions
7 10-7	§3.6 Derivatives of Logarithmic Functions (cont.)— Logarithmic Differentiation; Differentiation of All Exponential Functions	§3.7 Rates of Change in the Natural and Social Sciences*	§3.8 Exponential Growth and Decay	**Computer Lab 6** Differentiation of Log Functions and Exponential Functions; Graphs of Log and Exponential Functions (including Asymptotes); Computations with Logarithms	§3.9 Related Rates
8 10-14	§3.9 Related Rates (cont.)	§3.10 Linear Approximations and Differentials	§3.10 Linear Approximations and Differentials (cont.)— Propagated Error Omit §3.11 Hyperbolic Functions	**Computer Lab 7** Exponential Growth and Decay; Linear Approximations and Differentials	§4.1 Maximum and Minimum Values—the Extreme Value Theorem and Fermat's Theorem
9 10-21	§4.1 Maximum and Minimum Values (cont.)— the Closed Interval Method	§4.2 The Mean Value Theorem	§4.3 How Derivatives Affect the Shape of a Graph— Increasing and Decreasing Functions and Local Extreme Values	**Computer Lab 8** The Closed Interval Method; Increasing and Decreasing Functions	§4.3 How Derivatives Affect the Shape of a Graph (cont.)— Concavity and Inflection Points
10 10-28	§4.4 Indeterminate Forms and L'Hospital's Rule—Basic Forms	§4.4 Indeterminate Forms and L'Hospital's Rule (cont.)—Other Forms	§4.5 Summary of Curve Sketching— Symmetry and Review for Test 2 (time permitting)	**Test 2** **10-31-13**	§4.5 Summary of Curve Sketching— Slant Asymptotes **Last Day to Drop (11-1-13)**
11 11-4	§4.7 Optimization Problems **(Priority Registration Begins)**	4.7 Optimization Problems (cont.)	§4.8 Newton's Method	**Computer Lab 9** Concavity; Symmetry, Slant Asymptotes, Newton's Method	§4.9 Antiderivatives

12 11-11	§4.9 Antiderivatives (cont.)— Velocity and Acceleration	§5.1 Areas and Distances – Riemann Sums	§5.1 Areas and Distances – Riemann Sums (cont.) 5.2 The Definite Integral, the Midpoint Rule	**Computer Lab 10** Riemann Sums, the Midpoint Rule, Computing Definite Integrals	§5.2 The Definite Integral (cont.)
13 11-18	§5.3 The Fundamental Theorem of Calculus	§5.4 Indefinite Integrals and the Net Change Theorem	§5.4 Indefinite Integrals and the Net Change Theorem (cont.)	**Computer Lab 11** Definite and Indefinite Integrals, Applications of Integration **or Lab Final**	§5.5 The Substitution Rule
14 11-25	§5.5 The Substitution Rule (cont.)	§6.1 Area Between Curves—Type I Regions	§6.1 Area Between Curves—Type II Regions	**Thanksgiving Holiday 11-28-13** **Exam**	**Thanksgiving Holiday 11-29-13**
15 12-2	§6.2 Volumes	§6.3 Volumes by Cylindrical Shells	§6.4 Work*; §6.5 Average Value of a Function*	**Test 3 12-5-13**	**Review for Final Exam (Time Permitting)**

*This section may be omitted due to time constraints.

Homework: Homework assignments will be assigned for each section covered in the text. A list of recommended problems will be posted on Blackboard.

The content of this outline and the attached schedule are subject to change at the discretion of the professor.

Student Signature – I have read and understand the syllabus for this class. I understand that the content of this syllabus and the topical outline are subject to change at the discretion of the professor. I have read and understand the HBU Classroom Policy posted on Black Board. **I promise to uphold the Code of Academic Integrity at Houston Baptist University and will not tolerate its violation by others**.