

Calculus I

Math 221-01

Spring 2012

Instructor: Mary E. Sullivan

Office: S-109

In-Person Office Hours:

- MWF: 8:30 – 8:50, 10:00 – 10:40
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Description: This standard Calculus I course includes limits, continuity, differentiation and applications of algebraic and trigonometric functions, antiderivatives, approximation of area, and the Fundamental Theorem of Calculus.

Prerequisite: C- or better in Precalculus (MATH204) or Precalculus (MATH217) or equivalent, or waiver by placement testing results, or departmental approval.

Critical Thinking: This course involves intensive critical thinking because at the completion of this course, students will be able to demonstrate on the final exam:

- Organize and connect ideas.
- Make estimates and approximations and judge the reasonableness of the results.
- Apply quantitative and/or qualitative techniques, tools, formulas and theories in the solution of real-life problems and to recognize when to apply those techniques, tools, formulas, and theories.
- Interpret data presented in tabular and graphical form and utilize that data to draw conclusions.

Required Text: Briggs/Cochran, Calculus , first edition, 2010, Pearson, ISBN: 978-0-321-66407-5

Calculator: Voyage 200 Calculator (available for rental)

Teaching Procedures: This course will be taught by means of lectures and in-class activities, with ample opportunity for student questions. The student is expected to read the sections in the book that pertain to the topics discussed in class.

Attendance: Regular attendance is strongly recommended. I will take attendance at the beginning of every class. If you come to class late, please see me at the end of class so that I can mark you present. If you must miss a regular class, you are still responsible for the material that was presented in class.

Homework: Homework will be assigned at the end of every class and should be completed by the next class session. Answers for odd-numbered problems are available in the back of the book.

Quizzes: Quizzes will be given regularly during class and will be based on the homework assignment that was due that day. Quizzes are closed-book and may not be made up. The lowest three quiz grades will be dropped.

Exams: Four exams will be given approximately every three weeks during the course of the semester. Exams must be taken during the regular class time. No makeup exams will be given for any reason. The grade on the final exam will replace two lower exam grades (including zeros on missed exams).

A cumulative final exam will be given on Friday, December 16.

Grading: Your course grade will be calculated as the average of your exam grades, final exam grade, and quiz average.

above 92	A	80-82	B-	67-69	D+
90-92	A-	77-79	C+	63-66	D
87-89	B+	73-76	C	60-62	D-
83-86	B	70-72	C-	below 60	F

For course grades, I follow standard rounding procedures. Any percentage that ends in 0.5 or higher will be rounded up to the next percentage point. For example, if a student has a 79.5%, then that percentage will round up to an 80% or a "B-." That also means, however, if the number is 0.4 or less, then that percentage will be rounded down to the lower percentage point. For example, if a student earns a 79.4%, then that would round down to 79% or a "C+." As with any grading system, the cutoff points for the letter grades are arbitrary. That means that someone will always be close to getting the next letter grade.

The grade you earn is the grade you will receive in this course. Grades are not negotiable. You will not be allowed to make up work, substitute alternative assignments, or submit extra assignments in order to improve your grade during the semester or after the semester ends.

Extra Credit: There is no extra credit available in this class.

Incompletes: Grades of incomplete are given only in situations when extenuating circumstances such as an illness or a family emergency prevent a student from taking the final exam or fulfilling a specific requirement in the course. The grade of "I" cannot be used to give students additional time to complete course assignments in order to raise their grade.

Getting Help: There are several ways to get help during the semester.

1. You can contact me by email. I will answer all email within 24 hours (and usually much sooner).
2. You can attend my office hours.
3. You can visit Massasoit's Academic Resource Center (ARC). The ARC provides tutoring at no cost. Tutoring is available by appointment or on a drop-in basis.

Accommodations Statement: Students with disabilities who believe that they may need accommodations in the classroom are encouraged to contact a disability counselor on campus as soon as possible. Students at the Brockton Campus with learning disabilities and all students at the Middleboro Center should contact Andrea Henry, at extension 1805. Students with physical disabilities at the Brockton Campus should contact Mary Berg , at extension 1425. All students at the Canton campus should contact Mary Berg at extension 2132.

Course Outline

The following is a **tentative** course outline. Changes may become necessary.

Chapter 1: Functions

- 1.1 Review of Functions
- 1.2 Representing Functions
- 1.3 Trigonometric Functions

Chapter 2: Limits

- 2.1 The Idea of Limits
- 2.2 Definitions of Limits
- 2.3 Techniques for Computing Limits
- 2.4 Infinite Limits
- 2.5 Limits at Infinity
- 2.6 Continuity
- 2.7 Precise Definition of Limits

Test 1

Chapter 3: Derivatives

- 3.1 Introducing the Derivative
- 3.2 Rules of Differentiation
- 3.3 The Product and Quotient Rules
- 3.4 Derivatives of Trigonometric Functions
- 3.5 Derivatives as Rates of Change

Test 2

Chapter 3: Derivatives (continued)

- 3.6 The Chain Rule
- 3.7 Implicit Differentiation
- 3.8 Related Rates

Chapter 4: Applications of the Derivative

- 4.1 Maxima and Minima
- 4.2 What Derivatives Tell Us
- 4.3 Graphing Functions

Test 3

Chapter 4: Applications of the Derivative (continued)

- 4.4 Optimization Problems
- 4.5 Linear Approximation and Differentials
- 4.8 Antiderivatives

Chapter 5: Integration

5.1 Approximating Areas under Curves

5.2 Definite Integrals

Test 4**Chapter 5: Integration (continued)**

5.3 Fundamental Theorem of Calculus

5.4 Working with Integrals

Cumulative Final Exam: Monday, May 14 from 10:30 – 12:30

Course Outcomes

COURSE OUTCOMES	OUTCOMES ACTIVITIES
At the end of this course, students will be able to	
Find limits in order to develop differentiation and integration.	<ol style="list-style-type: none"> 1. Estimate a limit numerically. (CT,TS,QS) 2. Determine a limit from a graph. (CT,TS,QS) 3. Evaluate a limit using analytic techniques. (CT,QS) 4. Find one-sided limits. (CT,TS,QS) 5. Find infinite limits and limits at infinity. (CT,T,QS) 6. Determine where limits fail. (CT,TS,QS)
Demonstrate an understanding of continuity in order to apply the concept to other topics in calculus.	<ol style="list-style-type: none"> 1. Determine continuity at a point, on an open interval and on a closed interval. (CT,TS,QS) 2. Use properties of continuity. (CT,QS) 3. Label a discontinuity as removable or nonremovable. (CT,TS,QS)
Differentiate algebraic and trigonometric functions in order to solve applied problems.	<ol style="list-style-type: none"> 1. Find the derivative of a function using the limit definition. (CT,QS) 2. Find the derivative of a function using the Constant Rule, Power Rule, Constant Multiple Rule, Sum and Difference Rules, Product & Quotient Rules, Chain Rule. (CT,TS,QS) 3. Find higher order derivatives. (CT,TS,QS) 4. Find the derivatives of trigonometric functions. (CT,TS,QS) 5. Perform implicit differentiation. (CT,TS,QS)
Solve applied problems involving differentiation.	<ol style="list-style-type: none"> 1. Solve related rate problems. (CT,TS,QS,R,W) 2. Find the absolute extrema of a function on an interval. (CT,TS,QS) 3. Use the first and second derivative tests to find relative extrema and intervals of increase and decrease for a given function. (CT,TS,QS) 4. Find points of inflection and intervals of concavity for a given function. (CT,TS,QS) 5. Solve optimization problems. (CT,TS,QS,R,W) 6. Calculate differentials. (CT,QS,R,TS)
Use limits and approximation techniques in order to develop the definition of a definite integral.	<ol style="list-style-type: none"> 1. Approximate area under a curve using upper and lower sums. (CT,QS,R,TS) 2. Evaluate definite integrals using the limit definition. (CT,QS,R,TS) (Light treatment)
Use numerical techniques in order to approximate a definite integral.	<ol style="list-style-type: none"> 1. Approximate the value of a definite integral using the midpoint rule, the trapezoidal rule, or Simpson's rule. (CT,QS,R,TS)
Integrate algebraic and trigonometric functions in order to develop the techniques necessary to solve applied problems.	<ol style="list-style-type: none"> 1. Use the Fundamental Theorem of Calculus to evaluate definite integrals and calculate area. (CT,QS,R,TS)

**Indicate the Core Competencies that apply to the outcomes activities and assessment tools: Critical Thinking (CT); Technology Skills (TS); Oral Communications (OC); Quantitative Skills (QS); Reading (R); Writing (W).