**SYLLABUS: Math 161 Calculus 1** **Don Faust**

The Calculus provides, fundamentally, solutions to two problems: the development of a fruitful concept of the slope of a curve at a point on the curve; and, the development of a fruitful concept of the area bounded by a curve. After more than 1500 years of struggle with these problems, solutions were basically constructed by the seventeenth century. But possibly what makes the Calculus so central to mathematics (and to the wide range of disciplines which make daily use of mathematics) is the great number and variety of ways which have been found in the last three hundred years, and which are continuing to be found, to make productive use of these solutions in successfully attacking many practical problems in the physical sciences and now also in the social sciences as well.

THREE MAJOR LEARNING OUTCOMES WHICH FLOW FROM THE ABOVE PARAGRAPH:

The student will be able to

1. Explain THE TWO FUNDAMENTAL PROBLEMS OF THE CALCULUS, namely what is to be meant by the slope of a curve at a point on the curve AND what is to be meant by area, including an overview of the long timeline related to them (roughly posed by the Greek mathematicians over 2000 years ago, unsolved for over 1500 years, and finally solved in the $17^{th}$ century);
2. Explain THE SOLUTIONS TO THE TWO FUNDAMENTAL PROBLEMS OF THE CALCULUS, namely the derivative and the definite integral respectively; and
3. Apply THE SOLUTIONS TO THE TWO FUNDAMENTAL PROBLEMS OF THE CALCULUS, namely solving problems involving instantaneous rates of change, precision graphing, optimization, and area, always with careful clear work and lucid explanations.

More generally, the following broad perspective may be helpful to you. The fundamental tools of continuous mathematics provide a rich storehouse of models for the representation and solution of many problems. Making intelligent use of these models involves both (1) developing a facility for analyzing problems and casting them in ways which, where appropriate, make good use of these models of mathematics, and (2) developing a facility for working with these models themselves. Our course will take us through a representative sample of these tools of mathematics, and will concentrate on both aspects (1) and (2) delineated above. It can be a very exciting journey (if your involvement is sincere and includes both good class attendance and a parallel daily commitment to hammering things out on your own through daily study and problem-solving), at the end of which you will find not only that your mathematical maturity has been substantially enriched, but also that the general analytical skills you bring to bear in the broader arena of your daily life will be substantially enriched as well.

**Texts:**

SINGLE VARIABLE CALCULUS with EARLY TRANSCENDENTALS, by Stewart

and

CALCULUS USING INFINITESIMALS by Faust

**Assessment:**

The assessments will consist of two mid-semester exams, a semester-long sequence of SUBMITTED ASSIGNMENTS (SAs), and a final exam. Only egregiously exceptional circumstances can justify missing a mid-semester exam. In such rare cases, permission to miss the mid-semester exam must be requested in advance, and a make-up exam (usually oral) would occur on the Friday or Saturday before final exam week.

The assessment framework is as follows: (please note especially the dates, already fixed, when the two mid-semester exams will take place):

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|---|---|---|
| Exam 1: | Wednesday 13 Feb | 200 points |
| Exam 2: | Wednesday 27 Mar | 200 points |
| SUBMITTED ASSIGNMENTS: to be finally submitted en masse, before or on Friday 19 Apr at 5 PM, for grade recording | | 200 points |
| Final Exam: | | 400 points |
| | Total: | 1000 points |

**Mastery:**

First, in addition to ungraded daily assignments, there will be a sequence of graded SUBMITTED ASSIGNMENTS each of which can be recomposed and resubmitted repeatedly (with a limit of the deadline stipulated above) until a joyous mastery level is achieved (and a check-mark is placed at the top of the mastery level solution). During the semester, while this process unfolds, no recording will be made of the mastery level achievement of individual SAs; hence the need, when ALL of them are completed (or brought to the level of a student-determined 'last submission') before Friday 19 Apr or on Friday 19 Apr before or at 5 PM, to re-submit **all of the Submitted Assignments collated and clipped together**.

Second, in regard to the two mid-semester exams, an 11-day MASTERY PERIOD will follow the return of each exam, during which time each student with an exam score less than 200 points can repeatedly submit attempts to compose complete solutions to ALL questions only partially answered during that class exam. If complete solutions to ALL such questions are composed by the deadline, then

"the least integer greater than or equal to (1/2)*(200 – (exam score))"

points are earned; if complete solutions to ALL such questions are not composed by the deadline, then none of these additional points are earned.

**Note on Assessment and Mastery:**

Please see the syllabus page
"**ASSESSMENT AND MASTERY COMPONENTS: SCHEDULE**"
for a schedule of both of these processes.

**Grading:**

90-100%, A; 80-89%, B; 70-79%, C; 60-69%, D; 0-59%, F. The grading may be less stringent, but not more stringent, than this.

**Note regarding special needs:**

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Dean of Students Office at 2001 C. B. Hedgcock Building (227-1700). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

**Further note:**

**This course satisfies the Foundation of Natural Sciences/Mathematics requirement. Students who complete this course should be able to demonstrate a basic understanding of mathematical logic; use mathematics to solve scientific or mathematical problems in college classes; express relationships in the symbolic language of mathematics; and appreciate the role of mathematics in analyzing natural phenomena.**

# ASSESSMENT AND MASTERY COMPONENTS: SCHEDULE

## MID-SEMESTER EXAMS AND MASTERY SCHEDULE

| | | |
|---|---|---|
| Feb 06 | Wednesday | Exam 1 delineation |
| Feb 13 | Wednesday | **Exam 1** |
| Feb 18 | Monday | Exam 1 returned; Exam 1 mastery period begins |
| Mar 1 | Friday | Exam 1 mastery period submission deadline is 5:00 P.M. |
| Mar 11 | Monday | Exam 1 solutions published |
| | | |
| Mar 20 | Wednesday | Exam 2 delineation |
| Mar 27 | Wednesday | **Exam 2** |
| Apr 01 | Monday | Exam 2 returned; Exam 1 mastery period begins |
| Apr 12 | Friday | Exam 2 mastery period submission deadline is 5:00 P.M. |
| Apr 15 | Monday | Exam 2 solutions published |

## SUBMITTED ASSIGNMENTS MASTERY SCHEDULE

After your instructor makes Submitted Assignments available to the class, each Submitted Assignment solution can be composed/recomposed and submitted/resubmitted repeatedly 'throughout the semester' as needed before the deadline of 5:00 P.M. on April 19. Each submission made at a joyous level of mastery will receive a checkmark at the top of the submission.

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|---|---|---|
| Apr 19 | Friday | Submission deadline for **all Submitted Assignments collated and clipped together**, for grade recording, is 5:00 P.M. |