Math 1310 Syllabus

Fall 2015

MATH 1310-012
Engineering Calculus I
Fall 2015
Meeting time: MTWF 8:35am–9:25am in JTB 120
Instructor: Daniel Smolkin
E-mail address: `smolkin@math.utah.edu`
Office: JWB 314
Office hours: MWF 9:30am–10:30am in LCB 121
Course website: it's on Canvas

Course Description

Calculus is the study of functions. Or, as wikipedia so eloquently states, "calculus is the mathematical study of change, in the same way the geometry is the study of shape." Though the ideas behind calculus date back to antiquity, calculus as we know it was invented in the 17th century to compute volumes of various shapes, and to solve problems in physics. Today, calculus is absolutely fundamental to any field that studies or models real-world phenomena.

Prerequisites

In order to take Math 1310, you need one of the following:

- A passing grade (C or better) in both, 1050 and 1060

- A passing grade (C or better) in 1080

- An AP Calc AB score of 3 or higher

- A score of at least 28 on the math section of the ACT

- A score of 630 or better on the math section of the SAT

- The appropriate score on the Math Placement exam given thorugh the Testing Center.

Please see me if you do not meet any of these requirements. Note that these prerequisites are in place for the students' benefit—a solid understanding of algebra and trigonometry is crucial for success in Math 1310. I personally believe that a C in your precalc classes is a little too low. You will probably struggle quite a bit in calculus if you didn't get at least a B in precalc.

The Utah math department has some videos of precalc lectures on its website. (See "tips for success" below).

Course text

The course text is *Calculus: Concepts and Contexts* by Stewart, fourth edition. The course will cover chapters 1 through 6.

Calculator policy

For this course, you will need a *scientific calculator*. That means a calculator that can compute logs, exponents, and trig functions. These cost about $20. You will not need a graphing calculator for this class. Indeed, graphing calculators will not be allowed on exams.

Grading and Course Policies (the important stuff)

Grading will be based on homework, labs, quizzes, and exams. Each student's grade for the course will be broken down in the following way:

Homework	Labs	Quizzes	Exam 1	Exam 2	Final
10%	15 %	15 %	20 %	20 %	20 %

Quizzes

I will drop everyone's two lowest quizzes. This is to account for days you were absent, days you weren't feeling well, or maybe just days you were unlucky. It is my policy not to let people make up quizzes unless they've been absent for two quizzes already. The only exception is for student athletes who are absent because of their sport. I am forced to accomodate these students. We will have a quiz (almost) every Friday of class. The quizzes will be based primarily on your homework

Homework

Homework will be assigned once a week. You'll be able to find all the homework assignments on canvas. Homework will generally be due **Fridays at 8:35am**. Late assignments will be docked 5%. To get full credit on any homework assignment assignment, you must

- show all of your work,

- have the correct answers, and

- present your content in an organized, legible manner.

The first two bullets should be pretty self-explanitory. Presenting your content in an organized, legible manner means:

- if your homework is written on two or more piece of paper, staple them together

- write your name and "Math 1310-012" on your assignment

- clearly label each problem you're working on

- leave a blank line or two between each problem

- if you hand-write your homework, write legibly

If you're going on to pursue a degree/career in science or engineering, it will be very helpful to learn how to type technical documents using something like LaTeX or Microsoft Office. I'd be happy to help anyone learn LaTeX during office hours.

Exams

Here are the dates when we will have exams

- Exam 1: Friday, October 2nd

- Exam 2: Friday, November 13th

- Final exam: Thursday, December 17th, 8:00am.

It is your responsibility to tell me as soon as possible if you will be missing an exam. You will not be able to make up an exam unless you let me know two weeks ahead of time that you'll be missing it, or you provide proof that you missed it for an emergency.

I will allow everyone to make corrections to the mistakes on their exams **on separate paper** for half-credit. This policy only applies to the first two exams, and not to the final exam. **Please do not alter your exams after I return them to you**. So the way this works is you will:

- receive your exam after I grade it

- look over it to see what you did wrong

- learn how to fix your mistakes

- write down solutions to the problems you missed on **separate** paper

- turn in the exam along with your corrected solutions to me.

Please turn in your revised solutions within a week of getting your exam back.

The grading scale

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
> 94	90–93	87–89	84–86	80–83	77–79	74–76	70–73	67–69	64–66	60–63	< 60

Tips for success

Come to office hours early; come to office hours often. If you don't seek help when you're confused about something in the course, things will only get worse! I'm here to help

The math tutoring center is a great place for (free!) student help. The tutoring center is located in room 155 of the T. Benny Rushing Mathematics Center, adjacent to the first floors of LCB and JWB. Their website is `http://www.math.utah.edu/ugrad/tutoring.html`

You learn math by doing it. In order to succeed, you should work hard on your homework. Make sure you're comfortable with all the problems and understand how they work. If not, seek help in office hours or the tutoring center. After I return your homework, you should actually look over the corrections and comments. Make sure you learn from your mistakes.

The department has video lectures corresponding to the course available at `http://www.math.utah.edu/Lectures`

For students convinced that they cannot do the math, there is an excellent website called Understanding Mathematics by Peter Alfeld, available at `http://www.math.utah.edu/~pa/math.html`

Course schedule (tentative)

Week	Sections	Title
1	1.3,1.5, 1.6	Functions, Compositions, Exponential Function, Logarithms, Inverse Functions
2	1.7-2.1, 2.2	Parametric Curves, Velocity, Limits, Limit Laws
3	2.2-2.5	Continuity, Derivatives, Rate of Change.
4	2.5-2.7	Relationship between a Function and its Derivative.
5	2.8-3.2	Derivatives of Polynomials and Exponential, Product and Quotient Rules.
6	3.3-3.5	Derivatives of Trig Functions, Chain Rule, Implicit Differentiation
7	3.6-3.8	Inverse Trig Functions, Log Functions, and their Derivatives, Applications.
8	3.9-4.2	Linear Approximation, Differentials, Related Rates, Max and Min Values. Module on GPS.
9	4.3-4.5	Derivatives and Shapes of Curves, Graphing, l'Hopital's Rule.
10	4.6-4.8	Optimization, Newton's Method, Antiderivatives. Project on Betz's Law.
11	5.1-5.3	Areas, Distances, The Definite Integral, Evaluating Definite Integrals
12	5.4-5.6	Fundamental Theorem of Calculus, Substitution Rule, Integration by Parts.
13	5.7-5.9	Integration Techniques, Approximate Integration.
14	5.10, 6.1-6.2	Improper Integrals, Areas Between Curves, Volumes.
15		Review.

Learning objectives

The goal of Math 1310 is to master the basic tools for the study of functions $f(x) = y$, termed the calculus, and become skilled in its use for solving problems in science and engineering. These basic tools and problem solving skills are described below.

The tools and skills

- Students will understand how to transform functions into other functions through x- and y- translations and rescaling, re-parameterizations, and function composition. Students will also know the properties of special classes of functions including logarithms, exponential functions, polynomials, and rational functions; and know how to obtain function inverses $f^{-1}(y) = x$ when they exist.

- Students will master the concept of a limiting value of a function $f(x) = y$ when x approaches a value c, know when limits exists, utilize limit laws, how the property of continuity of a function at c relates to its limiting value, how asymptotic behavior can be described by limits, and how limiting values can be specified even when the $f(c)$ is not defined.

- Students will understand how to use limits to compute the derivative of a function f' that describe or rate of change of a function f.

- Students will be able to utilize derivatives to model how two related quantities change with respect to each other, including motion of objects by in terms of velocity and acceleration.

- Students will also learn the methods of differentiation for different classes of functions including exponential and logarithmic functions, trigonometric and inverse trigonometric functions, power functions, and compositions, sums, products, and quotients of functions, as well as differentiating functions that are only implicitly defined by an equation.

- Students will also be able to utilize the derivative in applied contexts, including function approximation, and how the average slope of a function relates to the derivative through the mean value theorem. If two quantities are related by an equation, students will be able to obtain the derivative of one quantity by knowing the derivative of the other.

- Students will know how to utilize linear approximations to perform numerical/algorithmic equation solving via Newton's method. Also, students will be able to utilize the derivative to find maximum,

minimum, or otherwise "optimal" input values for equations important in science, business, and engineering.

- Students will understand the definition of the integral of a function as the limiting value of an increasingly large average of function values. They will be able to relate the integral to anti-differentiation, when appropriate, through the fundamental theorem of calculus.

- Students will also be able to relate the integral to the area under the function's curve, know how to approximate the integral by a finite sum, and how to integrate over infinite-length domains. Specific integration techniques will also be mastered, including substitution, integration-by-parts, and partial fractions.

- Finally, students will understand the key concept underlying integration, that it computes the net accumulation of a quantity through summation of the change in the quantity amount per unit of time or space, over an specified interval of time or space.

Problem solving fluency

- Students will be able to read and understand problem descriptions, then be able to formulate equations modeling the problem usually by applying geometric or physical principles. Solving a problem often requires a series of transformations that include utilizing the methods of calculus.

- Students will be able to select the appropriate calculus operations to apply to a given problem, execute them accurately, and interpret the results using numerical and graphical computational aids.

- Students will gain experience with problem solving in groups.

- Students should be able to effectively transform problem objectives into appropriate problem solving methods through collaborative discussion.

- Students will also learn how to articulate questions effectively with both the instructor and TA, and be able to effectively articulate how problem solutions meet the problem objectives.

ADA Statement

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 801-581-5020. CDS will work with you and the instructor to make arrangements for accommodations.

All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.