Syllabus

General Info

Course MAT121 Calculus I
Instructor Charilaos Skiadas (skiadas at hanover dot edu)
Term Fall 2017-2018
Office SCH 121C
Office Hours MWF 10:00am-10:30am, and by appointment.
Book *Calculus*, 2nd ed, by Jon Rogawski
Websites for notes[1]
Class times Section D: MWF 12-1:10, Section E: MWF 1:20-2:30, in SCH102.

Course Description

This course is an introduction to *Differentiable and Integral Calculus*, most commonly called simply Calculus. Calculus is the study of the analytic properties of the real numbers and functions over the real numbers. Instead of focusing on purely algebraic properties of numbers, we will consider the *closeness* of numbers to each other, and how to construct new concepts from that. In sort, we will study the *real number line* as a continuous whole, rather than individual numbers.

As a simple example, consider what happens to the expression $\frac{\sin x}{x}$ when we look at numbers of x very close to 0 (we obviously cannot plug in exactly 0). This turns out to be related to the tangent line of the graph of the sine function at $x = 0$, which directly relates to the graphical properties of the sine function. All this will lead us to the all-important notion of derivatives.

Later we will spend a considerable amount of time utilizing the powerful tools that derivatives provide us. We will look at how to find maximum and minimum values for functions, which has extremely important applications to other disciplines. We will also look closer at the relation between derivatives and the graph of the function.

We will close the course with a study of the computation of areas under the curves, via the concept of an integral, and we will look at the very deep and surprising relation between integrals and derivatives, known as the *fundamental theorem of calculus*. This theorem offers us powerful tools for computing areas under curves, and we will end the course by showing applications of these tools.

Objectives

Here are the courses' main objectives:

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[1]skiadas.github.io/Calc1Course/site/

General objectives

- You will be exposed to the discipline of mathematics, and will develop an understanding of the process of mathematical reasoning, in the context of Calculus.
- You will practice reading and writing mathematical arguments.
- You will apply our new mathematical knowledge to solve practical problems.
- You will develop critical thinking skills as you consider the application and limits of mathematical reasoning.

Mathematical objectives

- You will learn about the fundamental concept of limit, and how it is used to construct other concepts.
- You will learn about the notion of derivatives and the central role it plays in numerous investigations.
- You will learn how the task of computing areas under curves can be linked via the concept of integrals to that of differentiation.

Prerequisites

These are concepts you should feel comfortable with already. You may want to review some of these concepts now.

- simplifying complex fractions
- solving a linear equation by rearranging terms between the two sides
- solving linear and other inequalities (example: find all x such that $\frac{x-1}{x-2} > 1$)
- quadratic formula (for solution to $ax^2 + bx + c = 0$)
- "difference of squares" identity
- multiplying polynomials (e.g. expand $(x+1)(x^2 - x + 1)$)
- factoring a quadratic polynomial into linear terms when possible
- graphs of linear and quadratic functions
- graphing a function by computing numerous values
- trigonometric functions, their graphs and basic properties
- trigonometric function values at 0, $\pm\frac{\pi}{2}$, $\pm\frac{\pi}{3}$, $\pm\frac{\pi}{6}$
- relations between the trigonometric functions (e.g. $\sin^2(x) + \cos^2(x) = 1$)
- area computation formulas for rectangles, triangles, circles

Course Components

Reading Notes and Practice Problems

On the website you will find a schedule[2] with links to documents for each class day. In those documents you will find notes for the day's lesson, a reading assignment, and

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[2]http://skiadas.github.io/Calc1Course/site/schedule.html

a list of practice problems. You should work on those practice problems, and ask any questions you have about them. You do not have to turn the problems in, but having practice with those problems will be crucial for your success in the class.

Class Attendance

You are expected to attend every class meeting, including labs. You are only allowed to miss 3 classes without excuse. From that point on, every unexcused absence will result in a reduction of your final score by one percentage point, up to a total of 5 points. Excused absences should be arranged in advance, and backed by appropriate documentation. Emergencies will be dealt with on an individual basis. There are very few reasons that would qualify as an excuse for an absence.

Homework Assignments

There will be regular homework assignments, about once per week. Questions on the exams tend to be similar to the homework problems, so it is to your advantage to really *understand* the homework, and not merely "do it" or copy it just to get it turned in. Homework assignments are 10% of your final grade.

Online Assignments

There will also be online homework assignments, details forthcoming. They are automatically graded and are there to help you get more practice solving problems. Online assignments are 10% of your final grade.

Exams

There will be two midterms, on Wednesday, October 4th and Friday, November 10th, and a final/3rd midterm during finals week. **You have to be here for the exams**. If you have conflicts with these days, let me know as soon as possible. Do not plan your vacation before you are aware of the finals schedule. In terms of your final grade, the exams you did better on will weigh more.

Getting Help

- The learning center has set up study groups for the class. USE THEM! The sessions are led by Emily Riley, one of our most experienced majors, at the following times in the Withrow conference room:
  - Tuesdays 7-8 pm
  - Thursdays 8-9 pm

- You should never hesitate to ask me questions. I will never think any less of anyone for asking a question. Stop by my office hours or just email me your question, which has the great benefit of forcing you to write it down in clear terms, which often helps you understand it better.
- You are allowed, and in fact encouraged, to work *together* and help each other regarding the notes and the practice problems. However, I strongly encourage you to try the problems out on your own first before talking to someone about them.
- You may discuss homework and online problems with others, but only after you have spent some time trying them on your own. And in any event the submitted work must be your own! So even though you may talk to others about the problem, when you sit down to write the answers you should be on your own.

Grading

Your final grade depends on class attendance, homework, project, quizzes, midterms and the final, as follows:

Component	Percent
Attendance	5%
Homework Assignments	10%
Online Assignments	10%
Worst Midterm	20%
Middle Midterm	25%
Best Midterm	30%

This gives a number up to 100, which is then converted to a letter grade based roughly on the following correspondence:

Letter grade	Percentage Range
A, A-	90%-100%
B+, B, B-	80%-90%
C+, C, C-	70%-80%
D+, D, D-	60%-70%
F	0%-60%