

# Syllabus

## Math 121 - Calculus II

### Winter 2017

**Professor:** Rafe Jones

**Office Hours:** Monday 10:00-11:00; Tuesday 10:00-11:00; Wednesday 9:00-10:00, 3:00-4:00; Friday 11:00-12:00; or just stop by and see if I'm around (it helps to make appointment, though it's not strictly necessary). I have a schedule posted on my office door that gives a general idea of my whereabouts.

**Office:** CMC 226

**Phone:** x4450

**Email:** rfjones@carleton.edu

**Course meeting times:**

MW 11:10-12:20, F 12:00-1:00 in CMC 206

**Course Web Site:** <http://www.people.carleton.edu/~rfjones/Math236w17/index.html>. If you don't want to type this into your browser, just google "rafe jones" then click on the top result to get to my homepage (an advantage of having an unusual first name). Scroll down just a bit and you'll see a section titled "Courses" containing a link to the Math 121 website.

**Text:** *Calculus: early transcendentals, 3rd edition* by Jon Rogawski.

**Course Content and Goals:** This course continues the exploration of functions begun in Calculus I, where you learned about the fundamental calculus operations of differentiation and integration. Our first goal is to find equivalents in the world of integration to the many rules for taking derivatives that you saw in Calc I. Unfortunately, we'll see that these equivalents are far less effective, leaving us with many functions that are very difficult to integrate exactly, and some that are simply impossible. Nonetheless, we'll use the techniques of integration we've developed to help solve certain differential equations (by using integration to undo the derivatives that appear in the equations). One way to handle the impossibility of integrating some functions is to learn how to approximate complicated functions with simpler ones. Taylor series allow us to rewrite complicated functions like  $\sin(\sqrt{x})$  as a kind of infinite polynomial, and in particular we can approximate seemingly mysterious numbers like  $\sin(\sqrt{2})$ . Once we can approximate functions, we can approximate their integrals, too. But there's a catch (isn't there always?), namely that using these power series involves adding infinitely many numbers. How can those infinitely many numbers possibly add up to a finite answer in a way that makes sense? It seems impossible, but it's not. The poet William Blake wrote

*Hold Infinity in the palm of your hand  
And Eternity in an hour*

We'll see how the first line comes true in a mathematical sense. But not *every* sum of infinite numbers does add up to a finite answer in a way that makes sense. Determining which infinite sums make sense, or converge, will occupy most of the last third of the course.

In terms of the book, we will cover chapters 7, 8, 9, and 10. By the end of this course, I expect you to:

- Be able to evaluate a broad range of integrals
- Understand what a differential equation is, and how to translate a problem given in words into a differential equation.
- Know how to solve separable differential equations (including logistic differential equations).
- Understand what it means for a sequence or series to converge, and know a few tests for convergence.
- Understand when a function can be expanded as a power series, and when it is useful to do so.
- Understand how pervasive the notion of limit is throughout calculus.
- Be able to express yourself mathematically in a clear way.

**Getting information and help:** If you have questions about any organizational aspect of the course, the first place you should go is the course web page (URL given at the top of the page). It is a veritable treasure trove of course-related information, and will be updated frequently. Among the things you'll find there are this syllabus, homework assignments, class schedule, exam-related announcements, review tips, and practice exams.

If you can't find the information you need quickly on the webpage, or have a mathematical question, don't hesitate to contact me. I will read emails until about 7 pm each night, and will respond to any messages you send me within 24 hours, provided that I am not traveling. For face-to-face discussions, stop by any time during my office hours, listed above. Feel free also to stop by outside of office hours, and if my door is open, you can come on in. However, I may not be available (there is a schedule posted on my office door). To make sure I'll be around, send me an email to make an appointment; give me 24 hours notice if at all possible.

For additional help pretty much any time, you are encouraged to go to the Math Skills Center. It's an almost ridiculously welcoming place that provides drop-in peer tutoring, and it also functions as a place to study, to do homework, and to meet for one-on-one tutoring. Its hours are Monday-Friday: 8:30am-11pm, Saturday: 2-5pm, and Sunday: 2-5pm and 7-11pm. Your homework assignment for the first week of class is to spend 10 minutes checking out the Math Skills Center in person.

Finally, I may periodically need to contact the whole class via email, for instance to let you know that there are new materials on the website. I'll use your official Carleton email accounts (the ones that end in carleton.edu), so be sure that you check this account regularly.

**Academic Integrity:** Academic integrity is something I take very seriously, and I expect you to follow the College policy on academic integrity (a link can be found on the course website). Because I encourage collaboration in this course, it is of critical importance that you clearly understand the difference between collaboration and plagiarism. On homework assignments, you should feel free to discuss problems with me, classmates, and people you meet at the Math Skills Center. *This does not include using internet sources, which you should avoid – there are many resources on campus that are far superior.* Crucially, when it comes time to turn in your work, the answers you write ***must be in your own words and come from your own hand.***

**Grading system:** Below is how your course grade will be determined. Following this there are detailed discussions of each component.

**Homework** 15%

**Writing assignment** 10%

**Midterm Exams** 22.5% each

**Final Exam** 30%

The grading system is as follows: 93 and up is an A, 90-93 an A-, 87-90 is a B+, 83-87 is a B, 80-83 is a B-, 77-80 is a C+, 73-77 is a C, 70-73 is a C-, 67-70 is a D+, 63-67 is a D, 60-63 is a D-, and lower than 60 is an F.

**Exams:** The exam schedule is given below; please note these dates and plan accordingly. Any conflicts must be legitimate and brought to my attention well before the exam is scheduled. If you have any specific learning disabilities or special needs and require accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to contact Disability Services (Andy Christensen is the coordinator – anchrist@carleton.edu) to obtain documentation of your disability.

**Exam 1:** In class, Wednesday, February 1

**Exam 2:** In class, Monday, February 27

**Final Exam:** Monday, March 13, 3:30-6:00 pm

**Homework:** The *only* way to learn and truly understand mathematics is by doing problems. So the homework is the most critical component of your learning in this course, and as such it counts for a considerable portion of your grade (15%). Homework will be assigned and collected every other class period, with a few exceptions (see the course schedule on the webpage). I expect that each assignment will take you 5-8 hours to complete. One of the best strategies for doing well on the homework, and gaining solid knowledge from it, is to start it as soon as it's assigned. Studies have shown that learning occurs best when you allow ideas – even ones you don't fully understand at first – time to sink in. So starting on problems, working until you get stuck, and then coming back to them the next night is a good recipe for understanding.

Because of our limited time in class, it won't be possible to do examples of every kind of problem that will appear on the homework. So you should expect some problems that don't look immediately familiar; however, the underlying techniques you'll need to do the problems will have been covered in class.

The homework assignments are posted on the homework page of the course web site. Please staple your homework and write your name on the first page. If you want your homework graded, hand it in on time. If you hand in an assignment late due to some legitimate reason, then I will quickly check to make sure it is complete, and then mark it down as such in the grade book. It won't count as part of your homework average (but it also won't count as a zero).

Learning often happens best when we are forced to explain our work or thinking to someone else. Sometimes just verbalizing your mathematical thoughts can deepen your understanding. So I encourage group work on the homework (groups of two or three tend

to be most effective). However, you must still each write the problems up on your own, as mentioned in the academic integrity section.

**Writing Assignment:** There will be one writing assignment towards the end of the semester, worth 10% of your grade. Writing is a hugely valuable skill in every kind of career, and the point of this assignment is to give you some experience with technical writing, that is, writing about subjects that include quantitative analysis and scientific thinking. When doing technical writing, you typically know more about the subject than the audience you're writing for, and so you need to carefully explain what you're doing.

For this assignment, you'll be required to work in groups of two, and to describe the solution to a problem involving applications of the derivative to a reader who is an intelligent non-mathematician. The assignment will have an open-ended component, which will give you a chance to display your creativity. Grading will be based partly on the correctness of the solution, but mostly on the clarity of your explanations and exposition.

**Calculators:** No calculators are necessary for this course. If you want to use one on the homework, you're welcome to, but keep in mind that calculator over reliance can get in the way of understanding the ideas. If you want to acquire a calculator, a model such as the TI-83 is sufficient. No calculators (or any other electronic devices) are allowed on exams. And they wouldn't help anyway, as the questions won't require any number crunching.

**Attendance:** Attendance is important to me and could make a difference in your final grade in borderline cases. The course moves quickly, and it is not easy to catch up missed material – so make the effort to come to class, and arrive on time, unless you have an outstandingly good reason (like being ill or a family emergency). If you contact me ahead of time and the absence is excused, then I will make every effort to provide you with the information that you missed. Otherwise, it is your responsibility to get notes from one of your peers and to make sure that you understand the material.

## How to do well in this class:

- *Attend class, participate, and ask questions.* Class will significantly augment the material in the book (particularly in worked examples), and there will be lots of chances for you to participate. The more engaged you are in class, the better prepared you will be to understand the ideas and work problems.
- *Do all the homework, and do it well.* The best way to learn math is by doing math. The homework is your chance to do math, and you will gain the most understanding by doing it well. This means that after you finish each problem, you should be able to explain the idea to your classmates, your friends, or your mom.
- *Work with your classmates.* The knowledge and abilities of your classmates are great assets. Learn to explain mathematics to your classmates. Math can be fun and rewarding when there are people around you who enjoy figuring out problems as much as you do. Take advantage of this opportunity and organize study groups.
- *Get extra help when you need it.* You have lots of options for getting extra help (see the section “Getting information and help”). Don't hesitate to use them! In particular, please come talk to me if you're feeling stuck.