Mathematics V1207x
Honors Mathematics A
Fall 2015

Instructor:	Prof. Michael Thaddeus	**Classroom:**	Mathematics 203
Office:	Mathematics 414	**Lectures:**	M.W. 4:10–5:25 pm
Office hours:	F. 10–12, or by app't.	**E-mail:**	mt324@columbia.edu

Course description: This is a rigorous, accelerated course in calculus and linear algebra. We will aim to become comfortable with a rather abstract point of view, and experienced in understanding and constructing mathematical proofs. We will begin with a speedy review of calculus in one variable, concentrating on the theoretical aspects which are skipped in most first-year calculus courses. We will then proceed to study the algebra and calculus of functions in several real variables. Specifically, we will embark on the study of linear algebra, including determinants, orthogonality, and eigenvectors, toward the end of the fall term. The continuation of this course, Honors Mathematics B, will conclude our study of linear algebra, and then deal with vector calculus, including the famous theorems of Green, Gauss, and Stokes.

You should expect to finish this course with a good grounding in basic real analysis and linear algebra, and some facility with the abstract ideas and methods of pure mathematics. To accomplish these goals, you will have to work considerably harder than you would in a normal calculus course. Indeed, each semester of this course is worth 4 points instead of the usual 3, and students who complete it need not take Linear Algebra, Mathematics V2010.

Course outline: Roughly, I expect to cover Apostol vol. I, chapters 1–5, parts of 6–7 and 11, and 15–16 in the fall; vol. II, chapters 3–5 and 8–12 in the spring.

Prerequisite: A grade of 5 on the BC Calculus Advanced Placement examination, or a A grade in a previous calculus course at Columbia, or the instructor's permission.

Required text: Tom M. Apostol, *Calculus*, volume I (Wiley). Reading and written assignments will be drawn from this text. Volume II will not be needed until the spring. Available from Book Culture on 112th St., or much cheaper used.

Assignments: To learn a subject like this one thoroughly, practical experience is essential, so a written assignment will be given each week. It will be posted on the course home page. You can learn as much from your fellow students as from lectures, so I encourage you to discuss the problems with each other, subject to the following ground rules: (1) do not consult any online sources; (2) make a serious effort to think through each question for yourself first; (3) list the names of all collaborators at the head of each assignment; (4) do not exchange any written work with others; (5) write up every problem in your own words.

Assignments are due on Fridays at 5 pm (after Thanksgiving, on Tuesdays at 5 pm), in a collection box in Mathematics Hall whose precise location will be announced soon. The use of a staple or paper clip and the submission of all problems together (not piecemeal) is absolutely, positively, utterly compulsory. Late assignments will be penalized by 10% of their point value for each day they are late. Warning: the building may be locked outside of library hours.

Each assignment will also include some supplementary problems which are not to be handed in. You are expected to do these, but when you do them is up to you. For example, they might make good preparation the week before an exam.

Reading: Each assignment will include 40 to 50 pages of reading in Apostol. Most of this will duplicate the lectures, but be warned that not everything in the reading will be covered in the lectures, or vice versa. In principle, you are responsible for both.

Exams: The midterm will be in class Wednesday, October 28. There will not normally be a makeup exam for the midterm; instead, you may be given an oral exam covering the same material. The final exam is expected to be on Monday, December 21, 4:10–7 pm (date to be confirmed in November). If you foresee conflicts, such as a religious holiday, with either exam let me know immediately. You may be excused from an exam only in a medical or family emergency, documented by a note from your doctor or dean. Also, please make your travel plans for the winter break early, as the date of the final exam cannot be moved.

Grading: Assignments 40%, midterm 20%, final 40%.

Teaching assistants: The teaching assistants for the course are Remy van Dobben de Bruyn ⟨rdobben@math.columbia.edu⟩ and Jordan Keller ⟨keller@math.columbia.edu⟩, who will grade the assignments. Both will hold office hours in the Help Room, 406 Mathematics Hall, at times to be arranged. One of Remy van Dobben's hours will be conducted as a recitation section. But you may also seek help any time the Help Room is open: see ⟨http://www.math.columbia.edu/general-information/help-rooms/406-math/⟩.

Contacting me: By e-mail at ⟨thaddeus@math.columbia.edu⟩, or, preferably, by telephone at 4–4308. Even better, come to my office hours on Friday from 10 am to noon in 414 Mathematics, or knock on my door at any time.

Devices: Phones, laptops, tablets, and all other electronic devices (except watches) must be turned off and put away during all classes and exams.

Course home page: ⟨http://www.math.columbia.edu/~thaddeus/honors.html⟩.