

HONORS LINEAR ALGEBRA (MATH-UA 148), FALL 2018

Tues/Thurs 2-3:50pm, WWH 312

Professor Robert Kohn

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WWH 502 (fall 2018 office hours TBA)

Please note: This honors version of Linear Algebra is intended for well-prepared students who have already developed some mathematical maturity. Its scope includes the usual Linear Algebra (MATH-UA 140) syllabus, and it uses the same text as MATH-UA 140, *however this class is different* from MATH-UA 140: we will move faster, covering additional topics and going deeper; also, we will place more emphasis on proofs and on computing.

Prerequisites: The official prerequisite is a grade of A- or better in MATH-UA 121 (Calculus I) or MATH-UA 211 (Math for Economics I), or the equivalent. Students may meet these prerequisites by sufficiently strong performance in an Advanced Placement exam, an A level exam, or an International Baccalaureat exam; for information about the the adequacy of such credentials, contact the Mathematics Department (djaggi@cims.nyu.edu).

Students with the the official prerequisites may still find this class too difficult, since it assumes more mathematical maturity than is typically developed in just a year of AP calculus or a single semester of college-level calculus. Potential sources of the desired level of mathematical maturity include summer or after-school enrichment programs, or additional exposure to college-level mathematics. Prior exposure to linear algebra is *not* expected, though students with such exposure will naturally find it helpful.

Are you ready for this class? Mathematical maturity is difficult to define, and difficult to assess. But students who are ready for this class would, for example, have experience with proofs by mathematical induction; with arguments involving summation and rearrangement; and with turning word problems into math problems. Thus if you're ready for this class you should find the following questions straightforward:

- (1) Use induction to show that $\sum_{j=1}^n j^3 = \frac{n^2(n+1)^2}{4}$ for any integer $n \geq 1$.
- (2) Show that for any real numbers a_1, \dots, a_n (not necessarily positive), $\sum_{i,j=1}^n a_i a_j \geq 0$.
- (3) Recall that an "opening-upward parabola centered at 0" has the equation $y = ax^2 + b$. Show that the points $(1, 1)$ and $(2, 2)$ lie on a unique opening-upward parabola centered at 0, and find the equation of that parabola.

Textbook: Our text is *Introduction to Linear Algebra*, Fifth Edition (2016), by Gilbert Strang. The publisher is Wellesley-Cambridge Press <http://www.wellesleycambridge.com/> Ordering directly from Wellesley-Cambridge Press appears to be cheaper than from Amazon. The NYU bookstore should have copies at the beginning of the Fall semester. Please get the 5th edition (not a prior edition).

Course requirements: There will be weekly homework assignments, two midterm exams, and a final exam. They will be weighted equally (1/4 HW, 1/4 each midterm, 1/4 final

exam). In calculating your HW score for the semester, one week's HW (the lowest) will be excluded.

Semester plan: A week-by-week plan (including the dates of the exams) will be posted by the beginning of the semester.

Some Policies

Preparing for class: You will be asked to read a section of the book in advance of each class. Our class time is for discussing ideas, doing examples, etc. It is intended to *supplement* the book, not to replace it. Ideas and examples are important; thus, to do well in this course you are strongly advised to *come to every class*.

Collaboration on homework: Collaboration is encouraged. However each student must write up his/her own solutions (this is an important part of the learning process). If you work closely with someone else, get help from a book, take a solution from the web, etc, please *identify your collaborators and/or sources*. Direct copying of another student's solutions is *not* permitted – both because it amounts to cheating, and because it defeats the entire purpose of the homework (which is to gain practice and familiarity with new concepts and techniques).

Late HW: Each HW assignment will have a due date (usually by the beginning of a particular class). Late HW will not be accepted. Please turn in hard copy if possible; if this isn't possible, a single PDF sent by email is OK. (Separate jpg's of each page are *not* acceptable.)

Computing: Programs such as Matlab and Mathematica are useful tools for solving linear algebra problems. (Even Excel can do basic linear algebra.) You will be introduced to Matlab a few weeks into the semester. When a HW problem calls for by-hand calculation, you are still welcome to check your work using a program.

Makeup exams: Makeup exams will be given only for legitimate reasons such as religious holidays, conflicts with university-sponsored activities (eg athletics), or documented illness. If the reason for requesting a makeup is known in advance, permission to take a makeup *must* be requested *before* the exam date. Requests based on personal convenience (eg flights home are cheaper before the final) will *not* be granted.

Academic integrity: Plagiarism and cheating will not be tolerated. NYU's College of Arts and Sciences has policies in this area, and they will be followed. See <http://cas.nyu.edu/academic-integrity.html>