

Math 312: Linear Algebra

Spring 2019 Syllabus

Instructor: Renee Bell (rhbell at sas DOT upenn DOT edu)

Lectures: Monday, Wednesday, Friday 1-2PM in Stiteler Hall B26.

Office hours: Monday 5-6PM, Friday 2:00PM-3:00PM, or by appointment. Don't hesitate to come to office hours! Math is explained best in person.

Office: DRL 4N61

Course Web Page: Canvas

Grader: Ziqi Fang, ziqifang@sas.upenn.edu

Prerequisites: Math 240 or its equivalent. You are expected to be comfortable with integrating and differentiating functions as well as the basic concepts of multivariate geometry, e.g. vectors vs. scalars, equations defining lines and planes, parameterized paths and so on. We will review matrix operations such as addition and multiplication but it is assumed that you have seen these before.

Course Overview: Linear algebra begins with solving an old problem: how can I find a solution to a system of linear equations? A key insight is that the techniques used to solve linear systems apply to a much broader class of problems. This course will cover the techniques used to solve linear equations, build off these techniques to deal with more complex problems, and discuss real-world applications such as Google's PageRank algorithm, principal component analysis, Markov chains, and the simplex method for optimization.

Topics to be covered: Solving Linear Equations, Vector Spaces and Subspaces, Linear Transformations, Orthogonality, Determinants, Eigenvalues and Eigenvectors, Various Applications.

(The above topics are conditional on time constraints and subject to change.)

Textbook: Our textbook will be the online zyBook: Linear Algebra. You can access this by creating an account at learn.zybooks.com and entering the course code UPENNMATH312Spring2019. If you are going to enroll in the class, **you must purchase this book within the first two weeks.**

Canvas: The class will make use of Canvas to post assignments, grades, announcements, etc. Students will be responsible for checking Canvas regularly during the semester.

Homework: Weekly, posted on the Canvas website. Homework will be due at 4pm Wednesdays on Canvas (a scanned copy); you can use the CamScanner app to scan handwritten assignments with your phone. The challenge exercises in the zyBook must also be completed by the same time. Your lowest two homework scores will be dropped.

Late homework will not be accepted.

Participation: Your participation grade will be based on completion of the reading each week and answering the participation questions in the zyBook.

Attendance and Course Notes: It is in your best interest to attend each lecture and take accurate notes. You will be tested on the material **as it is covered in class**. If you miss a lecture, make sure that you copy from a classmate and review the notes from that day.

Exams: There will be two in-class midterms and a final exam. Exam attendance is *mandatory*; please make sure you can attend the exams *before* enrolling in the course. You can take the make-up midterm only if you have a medical excuse or *prior* arrangement (you must inform me at least 24 hours prior). If you want an exam regraded, you must submit a regrade request within a week of the exam, which consists of a written explanation of what was graded incorrectly stapled to the front page of the exam.

The first exam is on February 15. Before drop deadline.

The second exam is on April 1. Before withdraw deadline.

The final exam is on May 6, 12-2PM.

Evaluation: Your final grade is based on written homework (15%), challenge exercises in the zyBook (5%), participation exercises in the zyBook (5%), the midterms (25% each), and the final exam (25%).

Extra resources:

- **Math Help** is available Monday through Thursday 4PM to 7PM in Education Commons 235. No appointment is necessary. This is a great place to work together on homework, with extra assistance available if need be.
- **The Tutoring Center** www.vpul.upenn.edu/tutoring/
- **Math Department Approved Private Tutors** www.math.upenn.edu/ugrad/tutors.html
- **MIT Open Courseware** Professor Gilbert Strang has lectures for an entire similar course available online. He has many resources available: videos and transcripts of lectures and recitations, problem sets with solutions, and exams. It's all available at ocw.mit.edu in courses 18.06 and 18.06 SC.
- **Khan Academy** This is a great resource for learning a lot of different math techniques; the videos here are more techniques oriented than theory oriented, and some of our more advanced topics aren't covered, but Khan Academy is still a great resource for large parts of this class. www.khanacademy.org/math/linear-algebra

- **Wikibooks** The Linear Algebra textbook on Wikibooks is fairly comprehensive and includes a large collection of examples and practice problems with in-depth solutions. en.wikibooks.org/wiki/Linear_Algebra
- **CAPS** (Counseling and Psychological Services at Penn) is a great resource to help you manage stress and personal problems and to generally have a happier and more productive time at Penn! Please reach out to them if you are feeling overwhelmed or just need someone to talk to <https://www.vpul.upenn.edu/caps/>