Math 115: Calculus II, with Probability and Matrices

Fall 2019 Syllabus

Instructor: Eduardo García-Juárez
Email: edugar@math.upenn.edu
Lectures: Tuesday-Thursday 10:30am-12pm in DRL 4C6.
Recitations: Wednesday 8-9am (201), 9-10am (202) in DRL 2C2.
Office hours: M 10:30am-12:30pm (or appointment by email) in DRL 3N4C.
Course Web Page: Canvas
First class, last class: August 27, December 9.

TA: Weichen Zhou (weichenz@sas.upenn.edu)
Office hours: Fridays 9am-10am in DRL 4C1.

Prerequisites: Math 104.

Course Overview: The course is divided into three separate parts: multivariate calculus, probability and linear algebra. The first part introduces functions of several variables, their graphic interpretation (surfaces, level sets, tangent lines and planes), differentiation and integration, and their application to compute areas, volumes and to solve optimization problems with constraints by Lagrange multipliers. The second part starts with combinatorics (permutations, variations, etc.), introduces probability and conditional probability (Bayes' theorem) and ends with probability distributions and their properties and applications. The last part shows how to use matrices to solve linear systems, least-squares problems and Markov processes.

Topics to be covered: (conditional on time constraints and subject to change)

- Part 0: Review of vectors
- Part I: Multivariate calculus (approx. 10 lectures)
  - Functions of several variables: continuity and differentiability
  - Functions of several variables: optimization
  - Functions of several variables: integration
- Part II: Probability (approx. 6 lectures)
  - Probability: Sets and counting
  - Probability: Conditional probability
  - Probability: Random variables, distributions.
- Part III: Linear algebra (approx. 6 lectures)
  - Matrices and linear systems
  - Matrices and least-squares
  - Matrices and Markov processes

Textbook: There are three books, one for each part:

-*Thomas' Calculus Early Transcendentals Custom Edition for the University of Pennsylvania.*
-*Schaum's Outlines Probability*, 2nd Edition, by Seymour Lipschutz, McGraw Hill. ISBN: 10:0-071-75561-6
-*Linear Algebra*, by Jim Hefferon, St. Michael's College (available online to download)

While the books are good for reading and getting prepared before the lecture, I will update lecture notes after each class. Moreover, all homework sets will contain full statements of the problems. In other words, the books are not mandatory. You will be tested on the material **as it is covered in class**.

Please also notice that older versions of Thomas' Calculus book are as useful as the new one for this course, you can find copies for all these books in the math library in DRL, and also you can visit the Greenfield Intercultural Center for new copies.

The following link contains very useful information from previous years, including many exams and what are considered the core problems for the course (many of them will be part of the homework assignments)
`https://www.math.upenn.edu/undergraduate/calculus-homepages/calculus/mathematics-115`

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

Homework: Weekly, posted on the Canvas website. Homework will be assigned on Tuesdays at 4pm (starting on the first week), and it will be due the following week on Wednesday no later than the beginning of recitation (online submission through Canvas). You will be allowed one week and a day to complete each assignment. **Collaboration between students is encouraged**, but you must write your own solutions, understand them, and list the names of your collaborators at the top of each assignment.

Late homework will not be accepted.

Your two lowest homework scores will be dropped.

Exams: There will be two in-class midterms and a final exam. Exam attendance is *mandatory*. 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). The final exam will be cumulative.

The first midterm is on Thursday October 3. **Before drop deadline.**
The second midterm is on Thursday October 31. **Before withdraw deadline.**
The final exam is on December 16, 9-11am.

Evaluation: Your final grade is based on the homework (25%), the midterms (25% each), and the final exam (25%). In-class quizzes (mainly during recitations) will add up to a maximum of 5 points as extra credit.

Extra resources: Most students struggle at some point during their years in college, and calculus courses are especially challenging for many. So please don't hesitate in leaning on the following useful resources:

- **Me**. I am always available through email to arrange a meeting (and of course during office hours). Ours is a rather small group, so take advantage of it!
- **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
  `https://www.math.upenn.edu/undergraduate/calculus-homepages/schedule-math-centers`
  `https://www.math.upenn.edu/undergraduate/getting-help/calculus-help`
- **CAPS**: Counseling & Psychological Services. This is an excellent resource, not sufficiently known, that everybody should use whenever stress or any other personal issues arise.
  `https://www.vpul.upenn.edu/caps/`
- **Greenfield Intercultural Center** is an excellent place to start getting to know Penn. You will find there many helpful links to events at the start of the Fall 2019 semester to help you get aquainted with resources on campus that can help make yo feel supported and at home on campus!
  `https://www.vpul.upenn.edu/gic/`
- **The Tutoring Center** `www.vpul.upenn.edu/tutoring/`
- **Math Department Approved Private Tutors** (Personally, I don't think it makes sense to pay this much having all the above resources)
  `www.math.upenn.edu/ugrad/tutors.html`