

## Math 215: Linear Algebra, Spring 2020

**Instructors:** Tarik Aougab (he/him/his) and Chung-Nan Tzou (he/him/his). Discussion sessions led by Jeff Tecosky-Feldman (he/him/his)

**Office Hours:** Will be announced during the second week of class after we get a feel for everyone's schedules and can pick times that work for all. If you'd like to meet during the first week of class, please feel free to set up an appointment via email with either of us.

**Textbook:** Linear Algebra and its Applications, by Lay, Lay, and MacDonald. If obtaining a copy is difficult for any reason (e.g. it's too expensive), we can make a copy available and we can certainly make the homework problems available. Please email either Tarik or Chung-Nan with any questions or concerns about purchasing

with them. This is because when dealing with hard problems in the real world, it will almost never be the case that some formula or recipe you learned in your linear algebra class will apply directly to your situation. You'll have to tweak, alter, or even completely replace those recipes because the real world is complicated! And **replace**

together to understand our world and our universe. That means that an important component of proof-writing is learning how to write in a way that is clear, concise, and inviting! Just like writing an essay in a history, English, or philosophy course, there is a certain "style" that goes along with writing good mathematical proofs.

The homework grading scheme reflects the fact that this is in some sense a writing course in as much as it is a course in abstract mathematical concepts. Each homework problem will be graded out of 4 points. Here is a basic rubric:

**4 points:** A complete and correct solution with no logical gaps, and clear/concise exposition.

**3 points:** A complete and correct solution with no logical gaps, but the exposition needs work OR a good attempt with clear exposition that would be fully logically correct if some minor details were fixed.

**2 points:** A good attempt with clear exposition but with a significant logical gap or error in the argument OR a good attempt with some minor logical issues AND the exposition needs work.

**1 point:** The beginnings of some ideas are present.

**0 points:** No serious attempt at a solution has been made.

#### **Course policies and recommendations for homework:**

**We strongly encourage students to work together on the homework assignments.** Collaboration is an incredibly important aspect of mathematical science and so you should think of the homework assignments as an opportunity to practice the skill of working well with others. On the other hand, it is very easy to "trick" yourself into thinking you understand something when working with a group of peers who come to an answer collectively. So, be sure that you are writing up your own solutions and that you understand the ins and outs of each problem. To do this, you should first think about the problems that you are given, think about them

- (1) Making sure everyone who wants it has the opportunity to speak frequently. This can mean checking in with each other to make sure everyone is following along and contributing when they have an idea.
- (2) Respecting people's pronouns and other aspects of their identity.
- (3) Making sure that everyone's ideas are acknowledged when writing up the final solution to a problem. When working in groups, solutions often evolve organically; an idea might pop into your head and you may think it's yours and yours alone, but perhaps you only arrived there because of something else that someone already said. Pay attention to what people are saying and try to learn from one another.
- (4) Honoring different types of contributions. In group work, *active listening* can be just as valuable as speaking. If you have ever processed a thought or an idea by talking it out with an attentive friend, you've experienced this truth firsthand. Listening carefully is in and of itself an important and difficult skill. It can involve being silent and creating the space for your partner(s) to say what's on their mind, and it can also involve asking the right insightful question at the right time. Practice listening with your collaborators, and also practice recognizing and appreciating when your collaborators are actively listening to you!

We will do our best to check in with folks periodically during the semester. **If at any time in the semester you want to be working in a group but do not have a group of students to work with, please let us know and we will help you find a working group. If at any time in the semester, you find yourself in a group of students for which the above behaviors aren't being practiced and people aren't feeling respected, please let**

- (2) Markov processes{ using linear algebra to understand the "long-term" behavior of a statistical process.
- (3) Network analysis{ using linear algebra to study large networks of people, economies, ideas, etc. etc. In fact example (1) is sort of a special case of this one.

The final project should:

- (1) be at least 5 pages long (standard font size and margins, single-spaced,);
- (2) include figures that can either be computer generated or hand-drawn, depending on the student's preference;
- (3) Not be plagiarized! Please be sure to cite all sources used and to put everything in your own words;
- (4) include a model example of the application, in which the student cooks up an *original* hypothetical situation with specific numbers, and then uses the application to solve some problem related to the example. e.g., when Google is using linear algebra, it's doing it in order to analyze millions of websites. A good example of what we are looking for would be coming up with a "model" of the internet with maybe only ten websites, and then applying the key idea to those ten websites.

**Resources:** Haverford College is committed to supporting the learning process for all students. Please contact one or both of us as soon as possible if you are having difficulties in the course. There are also many resources on campus available to you as a student, including the Office of Academic Resources (<https://www.haverford.edu/oar/>) and the Office of Access and Disability Services (<https://www.haverford.edu/access-and-disability-services/>). If you think you may need accommodations because of a disability, you should contact Access and Disability Services ([athc-ads@haverford.edu](mailto:athc-ads@haverford.edu)). If you have already been approved to receive academic accommodations and would like to request accommodations in this course because of a disability, please meet with one of us privately at the beginning of the semester (ideally within the first two weeks) with your verification letter.