

# Math 215: Linear Algebra

## Fall 2018

### Basic Course Information

**Instructor:** Prof. Jen Paulhus

**Time and Location:** Section 01: MWF 10:00 AM - 10:50 AM in 2243 Noyce Science Center  
Section 02: MWF 11:00 AM - 12:00 PM in 2243 Noyce Science Center

**Webpage:** <http://www.math.grinnell.edu/~paulhusj/teaching/ma215f18.html>

**email:** paulhus@math.grinnell.edu – Note that I do not check email between 9 PM and 7 AM, and only infrequently on the weekends. I will make every effort to respond to your emails within 24 hours.

**Office Hours:** Mondays: 1:30-2:30 PM and Thursdays: 10:00-11:00 AM (in my office)  
Tuesdays: 2:30 - 4:20 PM (in the back room of the MathLab–Noyce 2011)

**Office:** 2519 Noyce Science Center

**Mentors:** Vincent Noh [nohvince] and Tara Verma [vermatar]

**Mentor Hours:** Sundays: 3:00-4:00 PM and 7:30-9:30 PM, Thursdays: 7:00-10:30 PM (in the classroom)

**Text:** *Linear Algebra* by Joseph R. Milet

This is a draft version of a book. The PDF version is available on the class PWeb page, and options to order a printed copy are available on PWeb.

**Material Covered:** We will cover most of the book.

### Other Sources:

- *Linear Algebra* by Jim Hefferon

This is an online book that has been used in the past here.

<http://joshua.smcvt.edu/linearalgebra/>

- *A course in Linear Algebra* by David B. Damiano and John B. Little

A relatively cheap book which is also on reserve in Kistle. This book is more theoretical and goes into more material than we will cover.

- *Linear Algebra and its Applications* by David C. Lay

This book is also on reserve in Kistle and is mainly computational. It doesn't cover all the topics we will cover in depth.

For information about mathematical reasoning and proof writing:

- *Mathematical Reasoning: Writing and Proof, Version 2.0* by Ted Sunstrom

<http://scholarworks.gvsu.edu/books/9/>

- *How to Think Like a Mathematician* by Kevin Houston

This book is on reserve in the Kistle Science Library.

## What is Linear Algebra?/Learning Goals

Linear Algebra is the study of lines and planes in higher dimensional space, and special functions on these spaces. We will begin in 2 dimensional space to develop intuition and then generalize our results to higher dimension.

Here is what a successful student will master in this class.

- The key concepts of linear algebra: vectors, vector spaces, linear transformations, eigenvalues, eigenvectors, determinants, dimension, and linear systems.
- The basic building blocks of mathematical logic and proof such as *if then*, *there exists*, and *for all* statements, as well as negations.
- How to structure basic proofs, and how to construct correct mathematical proofs.

Growth toward these goals will be measured in class by the student's ability to

- know definitions, basic computational techniques, and fundamental examples in the subject,
- apply this knowledge to solve relevant problems on homeworks and exams, and
- write increasingly sophisticated mathematical explanations and basic proofs.

## Grading

**Homework:** Homework assignments are due to me *at the beginning of class* just about every Monday and Friday. Assignments will be posted on PWeb and the class webpage. No late homework will be accepted but I will drop your lowest homework score. Homework is 15% of your grade. Each homework assignment is worth the same amount of your final grade, although point totals will vary.

Due to time restrictions for the grader, not all the turned in problems will be graded most weeks. Homework will be graded for correctness. Write your name and which section you are in at the top of the first page and **staple!!** your homework if it is more than one page. Unstapled multiple page assignments will incur a 2 point penalty.

**Writing Assignments:** Many Wednesdays, a writing assignment will be due to me *at the beginning of class*. No late writing assignments will be accepted<sup>1</sup> and they may not be made up later. Some suggestions on good mathematical writing, will be posted on PWeb and the class webpage. Writing assignments are 10% of your grade.

**Exams:** There will be three in-class exams, tentatively scheduled for **Wednesday, September 26**, **Wednesday, October 31**, and **Wednesday, November 28**. The exams will be closed books, closed notes, and no calculators will be allowed. No makeup exams will be given unless agreed to beforehand, so contact me immediately if you have any conflict with an exam. The three exams will be 15% each.

**Final:** There will be a cumulative final which will count for 25% of your grade. The final exam is **Tuesday, December 18** from 9:00 AM - 12:00 PM for section 01 and **Thursday, December 20** from 9:00 AM - 12:00 PM for section 02. Do not make plans to go home early.

**Engagement:** The final 5% of your grade will be a participation grade. You will work every day with a different partner and your participation during that time will impact your final grade.

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<sup>1</sup>A small exception for homeworks typeset with L<sup>A</sup>T<sub>E</sub>X will be mentioned at a later date.

## **Class Policies**

Cell phone usage is strictly prohibited during class. I typically do not allow laptops or tablets in class, but if you would like to take notes on such a device, come talk to me.

### **Basic Classroom Courtesies**

Please show up on time, please do not leave in the middle of class unless it is an emergency, and please keep conversations among yourselves during class to an absolute minimum.

### **Attendance and Workload**

You are expected to attend every class and you are responsible for all material presented and changes announced during class. There is a strong correlation between attendance and grade performance in this course. There will be no extra credit, late homework will not be accepted, and no makeup exams will be given unless agreed to beforehand. The amount of time students spend on this course outside of class varies depending on many factors, but about 8-10 hours beyond the classroom time is quite typical.

### **Accommodations**

Grinnell College makes reasonable accommodations for students with documented disabilities. Students need to provide documentation to the Coordinator for Student Disability Resources, John Hirschman, located on the 3rd floor of the Rosenfield Center (x3089) and discuss your needs. Students should then notify me within the first few days of classes so that we can discuss ways to ensure your full participation in the course and coordinate your accommodations.

### **Academic Honesty**

Make sure you are familiar with the college's guidelines for academic honesty which you can find here: [http://catalog.grinnell.edu/content.php?catoid=12&navoid=2537#Honesty\\_in\\_Academic\\_Work](http://catalog.grinnell.edu/content.php?catoid=12&navoid=2537#Honesty_in_Academic_Work)

For this class, you are allowed (and even encouraged) to work together to solve homework problems but everyone must write their own solutions. Here are some more explicit instructions regarding this: if a few of you are sitting around discussing how to solve a problem and in the course of the conversation one of you figures out a key piece and discusses it with everyone else, and then you all go home and write up your own answers, that is fine. Additionally, you may discuss your written solutions with anyone you have worked with to solve a particular problem.

However, it is not ok if one of you solves a problem yourself first, and then gives other people the key pieces of the problem or proof. If you already have a solution and someone asks you how to solve the problem, you should tell them you already figured it out and they should talk to me or the mentors. Giving good hints is really very tough sometimes. Conversely, if you know your colleagues have figured out a problem, you should not ask them for help but instead should talk to me or the mentors.

**Consulting any completed solutions is academically dishonest.**

I repeat: **Consulting any completed solutions is academically dishonest.** Never search the internet for a solution to a problem. Reading a math solution is much easier than figuring it out yourself. It only hurts your learning to find solutions online or in other books. I intentionally write some difficult problems and do not assume most students will ace the homeworks. Talk to me or the mentors or other students who have not yet solved the problem if you are stuck.

As is mentioned above, giving a hint that helps but doesn't give away too much information is very hard. As such, you should not consult other students who have formerly taken the class for homework help.

There are very serious consequences if you are found to be in violation of one of these policies. A typical first offense is a zero on the particular assignment, your final grade in the course is dropped a full (or part of a) letter grade, and you are ineligible to receive honors from any department.

## **Mentors**

The mentors for Math 215 are Tara Verma, a senior Math and GWSS double major, and Vincent Noh, a senior Math major. They will hold mentor sessions on Sundays and Thursdays. They are available to talk about proofs and material from class. They can help discuss strategies for setting up homework problems, and they can give you guidance on your proof writing and logical thinking. They are also a great resource to talk about what it's like to be a math major, as both of them have taken several of our upper level courses. Both Vincent and Tara are on the department SEPC, and Vincent participated in the Budapest semester.

## **Success In My Classes**

Students come to this class with very different backgrounds, skills, and experiences. Usually the most successful students in my class have two things in common: they work hard and effectively, and they are able to self-reflect honestly and then make adjustments to their behaviors accordingly.

## **Unsolicited Advice**

Take ownership of your education.

One major goal of the class is to teach you how to understand the basic language of mathematics and logic. Like any new subject, this requires much practice, practice, practice.

Read ahead in the material. A list of pages to read before each class will be regularly updated on PWeb and the class webpage.

Most of you will be challenged during the semester. Be prepared to not "get" everything right away.

If you are struggling, come see me early.