

2240 Active Learning Handwrite

Welcome to linear algebra! Work with your classmates as you handwrite your responses to the following. You can handwrite on this handout or use a stylus to electronically write on the PDF that is available online.

1. **Class:** I reward and value your engagement and active learning in this class, where you will try course activities and get feedback from your peers and/or me as you are working. This may feel harder than a lecture style where you are mostly listening rather than doing—here you are mostly doing!—but educational research shows that it is much better for your learning!

ASU designates that “Face-to face component is not a lecture but provides time for discussion, demonstrations, problem-solving, and higher-level thinking and collaborative activities. Class time is used to apply course content in ways that can only be accomplished when everyone is together in the same place” <https://cetlss.appstate.edu/teaching-learning/course-delivery-options>.

ASU prepares students to employ various modes of communication that can help communities reach consensus or respectful disagreement: successful communicators interact effectively with people of both similar and different experiences and values and in this class you will practice oral and written communication during class by interacting with your peers and me. Regardless of gender, political party, race, religion, sexuality, or more this class is to be a welcoming environment, and so I want you to be sensitive and respectful to each other in upcoming discussions. Keep it a safe place to express meaningful ideas and opinions. Actively listen to others and encourage everyone to participate. Part of the welcoming environment is to keep an open mind as you engage in our class activities, explore consensus and employ collective thinking across barriers. Maintain a professional tone, show respect and courtesy, and make your contributions matter.

Write down any questions you have on the above or draw me a smiley face if you don't have any questions.

2. **Building Community Part 1:** Introduce yourself to the people around you—what are their preferred first names? If you weren't able to be there, give reference to anyone you had help from or write N/A otherwise.
3. Discuss with your classmates: Describe where did lines and linear approximations arise in Calculus with Analytic Geometry I, our prerequisite. Write down any questions you have or draw me a smiley face if you don't have any questions.

4. Next, read the following and respond as directed



Evelyn Boyd Granville was the second Black woman we know of to earn her PhD in mathematics. Dr. Granville's original research related to complex numbers but she also worked on numerous space missions, including Project Mercury, the first manned space flight program: *I can say without a doubt that this was the most interesting job of my lifetime - to be a member of a group responsible for writing computer programs to track the paths of vehicles in space* (Granville, 1989).

Dr. Granville told me that

My favorite challenge to teachers and children is to solve the following problem using three different methods: Rabbits and chickens have been placed in a cage. You count 48 feet and seventeen heads. How many rabbits and how many chickens are in the cage? (Granville, 2007)

Let x be the number of rabbits and y be the number of chickens. Write a linear equation in terms of x and y that expresses how many heads there are.

5. Write a linear equation in terms of x and y that expresses how many feet there are.

6. Discuss with your classmates methods from Calculus with Analytic Geometry I and prior courses we could use to solve this system of 2 linear equations in the 2 unknowns, but don't actually solve it. Write down any questions you have or draw me a smiley face if you don't have any questions.

7. Consider the function $f(n) = \begin{cases} \frac{n}{2} & \text{if } n \text{ is even} \\ 3n + 1 & \text{if } n \text{ is odd} \end{cases}$ defined using these 2 linear expressions

Choose one whole number from among 3, 5 or 6 as a starting value n_0 and repeatedly apply this function to it, i.e. $f(n_0), f(f(n_0)), f(f(f(n_0))) \dots$. Write the sequence of numbers you obtain from this your one starting value and repeated applications of the function to the outputs, starting with your n_0 and continuing until it shows a repetition of 3 numbers in a row, repeated twice, like 1, 4, 2 is repeated twice here using $n_0 = 1$: $1, f(1) = 4, f(f(1)) = f(4) = 2, f(f(f(1))) = f(2) = 1, f(f(f(f(1)))) = f(1) = 4, f(f(f(f(f(1)))) = f(4) = 2$ so the list is 1, 4, 2, 1, 4, 2

8. After a couple of minutes, regardless of whether the sequence repeated 3 numbers in a row or not, compare to your classmates. Share your sequences, check them, help each other, and write them down here. If you all tried the same starting value for n_0 , try some others to write.

9. Discuss and respond: Make a group conjecture about the limits of sequences obtained via starting with any positive whole number $n > 0$ (not just 1, 3, 5 and 6) and applying $f(n) = \begin{cases} \frac{n}{2} & \text{if } n \text{ is even} \\ 3n + 1 & \text{if } n \text{ is odd} \end{cases}$
- Is there always a repetition of 3 numbers in a row?

10. Discuss and respond: Can you find any counterexamples to your group conjecture?

11. **Building Community Part 2:** If you are finished discussing and responding to the above before I bring us back together, chat to get to know your classmates better. Look for connections like perhaps classes other than linear algebra, majors and minors, where you call home, future plans (for break, next summer or after graduation)... If you had time to complete this, write down something you found interesting. Leave it blank otherwise.

Help each other: If you are finished with the handwrite before I bring us back together, first ensure that your entire group is finished too, and if not, help each other. Then take a look at upcoming class work in the class handouts.

Linear Algebra FAQ and Engagement—Optimize your Success and Understanding!

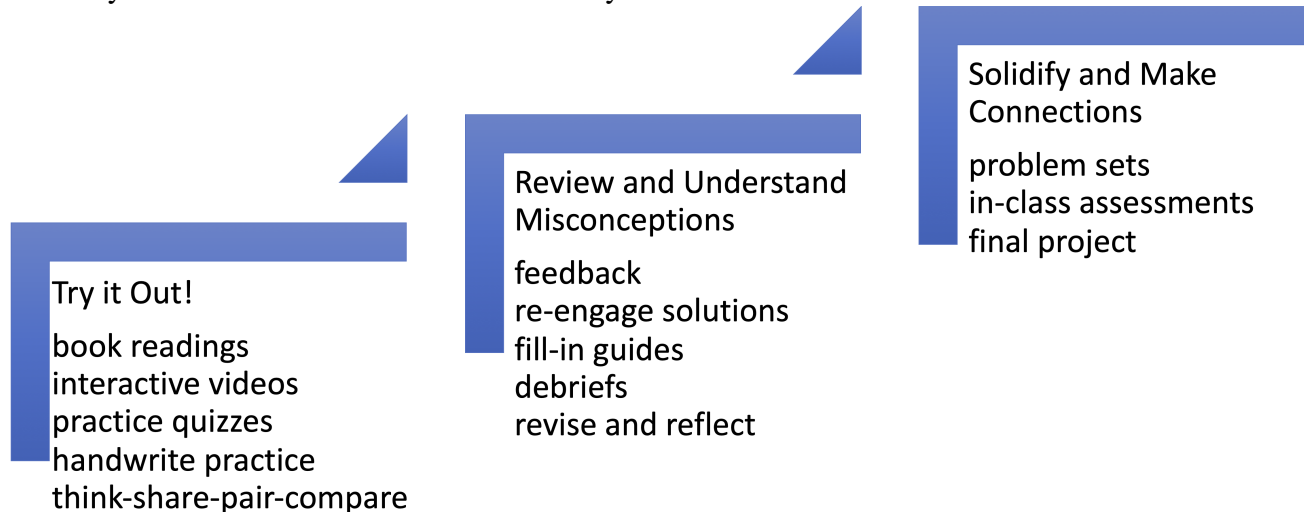
- Where can I find in-class and out-of-class activities?

On our ASULearn! See the modules with the activities organized by due dates. *In-class items, video slides and more* is a link near the top of the page, 3rd from the top, and handwrites are located there.

Look for the completion items under its date and turn them in on ASULearn. The sidebar index can help you see completion.

Problem Sets are also turned in on ASULearn, but they are not paired with a completion icon.

The ASULearn components work best from scrolling through the activities themselves on a computer as the calendar and the Moodle mobile app does not always show everything as designed, both for visibility and for due dates and some items only work from a browser.



- How do I contact you outside of class?

need help from me, tutoring, your classmates, or tech support? at the top of ASULearn (not e-mail!)

The Zoom link there is for my hours

Sunday, Monday, Wednesday 7–7:45pm

Tuesday, Thursday 9:45–10:15am and 12:30–1:30pm

If you can't make Zoom hours, select the dropdown item listing only you and I to contact me privately, or the whole class to send a message to everyone! Please use a salutation of Dr. Sarah, my preferred name, in communications with me. I strive to answer individual questions at least once a day, including the weekends, although I may respond within class. I prefer that you use Zoom hours as it is easier to discuss material in person.

- What should I do if I don't understand content or something about the course?

Ask me and your classmates questions inside and outside of class and review our activities in ASULearn—I have designed many resources to help you. Reviewing slides, videos, practice quizzes and solutions can often clear up confusion. We can also go over material in Zoom hours, like on a whiteboard. While other sources can be great to offer different explanations, I caution that they may have very different language and content—be sure you use our language and only what we have covered up to that point in handwrites and problem sets. We are following select parts of our book in an intentional ordering. One early example is row echelon form—we are using the book definition rather than some others that look different.

If it is an ASULearn activity, I have instructions inside each activity link on ASULearn, at the top. Ask me any questions. Access (or re-watch) the course intro interactive video, which explains many components. My course design is intentional and based on best practices from the scholarship of teaching and learning including *Make it Stick: The Science of Successful Learning*. Depending on your prior experiences, it may take some getting used to—I'm here to help you!

Tentative Calendar

Handwrites, begin assignments and major assignments have strict deadlines of 10:30am our next academic day. All other activities are those you should attempt for completion by then, but you'll have 2nd chances that remain open until closer to the corresponding in-class assessment. Some days are lighter than others and it will help you to progress on upcoming activities in advance, especially major assignments. Plan to spend 3.5–5 hours between classes, on average, as per the University-wide Statement on Student Engagement with Courses (our hybrid class is officially designed by the registrar and scheduled by the university for our third hour to be a part of the activities between classes).

	Class Tuesday	Between Classes (by 10:30am Thursday)	Class Thursday	Between Classes (by 10:30am Tuesday)
8/20– 8/22	active learning hand-write course overview module 1 overview	2240 interactive video download Maple (free) access e-text 1.1 read the e-text 1.1 interactive video 1.1 practice quiz syllabus	1.1 handwrite, activities t-shirt Thursday	turn in 1.1 handwrite 1.2 read the e-text 1.2 interactive video 1.2 practice quiz Maple intro video practice submitting PDF add ASULearn profile pic Zoom update & profile pic
8/27– 8/29	1.2 handwrite, activities	re-engage 1.1 handwrite turn in 1.2 handwrite 1.3 read the e-text 1.3 interactive video 1.3 practice quiz	1.3 handwrite, activities t-shirt Thursday	re-engage 1.2 handwrite turn in 1.3 handwrite 1.4 read the e-text 1.4 interactive video 1.4 practice quiz
9/3– 9/5	1.4 handwrite, activities	re-engage 1.3 handwrite turn in 1.4 handwrite 1.5 read the e-text 1.5 interactive video 1.5 practice quiz	1.5 handwrite, activities t-shirt Thursday	re-engage 1.4 handwrite turn in 1.5 handwrite 1.7 read the e-text 1.7 interactive video 1.7 practice quiz begin problem set 1
9/10– 9/12	1.7 handwrite, activities	re-engage 1.5 handwrite turn in 1.7 handwrite card sort 1 review 1 practice quiz	group review 1 t-shirt Thursday	re-engage 1.7 handwrite debrief 1.1–1.5, 1.7 problem set 1
9/17– 9/19	group debrief 1 module 2 overview	re-engage problem set 1 2.1 read the e-text 2.1 interactive video 2.1 practice quiz	2.1 handwrite, activities t-shirt Thursday	turn in 2.1 handwrite 2.2 read the e-text 2.2 interactive video 2.2 practice quiz
9/24– 9/26	2.2 handwrite, activities	re-engage 2.1 handwrite turn in 2.2 handwrite 2.3 read the e-text 2.3 interactive video 2.3 practice quiz	2.3 handwrite, activities t-shirt Thursday	re-engage 2.2 handwrite turn in 2.3 handwrite 2.8 read the e-text 2.8 interactive video 2.8 practice quiz
10/1– 10/3	2.8 handwrite, activities	re-engage 2.3 handwrite turn in 2.8 handwrite 2.9 read the e-text 2.9 interactive video 2.9 practice quiz begin problem set 2	2.9 handwrite, activities t-shirt Thursday	re-engage 2.8 handwrite turn in 2.9 handwrite card sort 2 review 2 practice quiz begin study guide
10/8– 10/10	group review 2	re-engage 2.9 handwrite debrief 2.1–2.3, 2.8, 2.9 problem set 2	group debrief 2 module 3 overview t-shirt Thursday	re-engage problem set 2 glossary 1 prepare for assessment complete open items

10/17	Fall break		in-class assessment 1 t-shirt Thursday	1.8–1.9 read the e-text 1.8–1.9 interactive video 1.8–1.9 practice quiz
10/22– 10/24	1.8–1.9 handwrite, activities	turn in 1.8–1.9 handwrite 6.1 read the e-text 6.1 interactive video 6.1 practice quiz	6.1 handwrite, activities t-shirt Thursday	re-engage 1.8–9 handwrite turn in 6.1 handwrite 2.7 read the e-text 2.7 interactive video 2.7 practice quiz begin problem set 3
10/29– 10/31	2.7 handwrite, activities	re-engage 6.1 handwrite turn in 2.7 handwrite card sort 3 review 3 practice quiz	group review 3 t-shirt Thursday	re-engage 2.7 handwrite debrief 1.8, 1.9, 6.1, 2.7 problem set 3
11/5– 11/7	group debrief 3 module 4 overview	re-engage problem set 3 3.1–3.3 read the e-text 3.1–3.3 interactive video 3.1–3.3 practice quiz	3.1–3.3 handwrite, activities t-shirt Thursday	turn in 3.1–3.3 handwrite 5.1–5.2 read the e-text 5.1–5.2 interactive video 5.1–5.2 practice quiz final project video begin final project
11/12– 11/14	5.1–5.2 handwrite, activities	re-engage 3.1–3.3 hand turn in 5.1–5.2 handwrite 5.6 read the e-text 5.6 interactive video 5.6 practice quiz begin problem set 4	5.6 handwrite, activities t-shirt Thursday	re-engage 5.1–5.2 hand turn in 5.6 handwrite card sort 4 review 4 practice quiz begin study guide
11/19– 11/21	group review 4	re-engage 5.6 handwrite debrief 3.1–3.3, 5.1–5.2, 5.6 problem set 4	group debrief 4	re-engage problem set 4 glossary 2 prepare for assessment complete open items
11/26	in-class assessment 2		University Break	course survey course evaluation work on final project
12/3	share final project ideas last day of classes	turn in final project	see below	
12/5 exam time at finals	turn in video presentation in ASU Learn assignment by the beginning of our assigned time during finals during our assigned time, conduct final project peer review and self-evaluation			
12/12	(optional) revise and reflect on one in-class assessment, one of the problem sets, due by 10:30am			