Welcome to Linear Algebra

Dr. Lewis

Fall 2022

What is Linear Algebra?

Linear algebra is the study of **linear maps**.

- In Calculus, you learn how to approximate any function by a linear function.
- In Linear Algebra, we learn about how linear maps behave.
- Combining the two, we can approximate how any function behaves.

What is Linear Algebra good for?

- In an abstract sense, linear algebra is arguably the most used tool in higher math.
- In computer graphics, linear algebra is used to help represent 3-dimensional objects in a two dimensional grid of pixels.
- Differential equations are often very difficult (or impossible) to solve exactly; we use linear algebra to understand approximate solutions in a vast number of engineering applications such as fluid flows, vibrations, heat transfer, etc.
- Google's famed Page Rank algorithm is based on linear algebra
- Sports rankings

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- Use and apply algebraic properties of a linear transformation.
- Determine geometric information about a linear transformation, including computing determinants, eigenvalues, and eigenvectors.

Overview of Team-Based Learning

- This course uses Team-Based Learning to promote collaboration and allow students to deeply engage with mathematics.
- The course is divided into 5 "modules".
- The first day of each module is the Readiness Assurance Process.
- Remaining days are spent working on activities in your teams.

Readiness Assurance Process

- In Canvas, you will find a list of the skills you should have **before each module starts**, along with resources to help you prepare.
  - Sometimes these skills are from previous courses.
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  - Sometimes (but rarely) these are new skills you will learn by watching the videos and answering embedded questions.

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- On the first day of the module, the Readiness Assurance Checks will ensure you have these skills.
  - First, you will individually work some problems
  - After everyone is done, you will work the same problems again collaboratively as a team.
- **The first Readiness Assurance day is Thursday!**

Class Activities

Most days we will spend our time working in teams through a series of activities in our teams

- These activities are designed to help you **explore** the material.
- Often, you will not immediately know how to complete them. You will have all the tools you will need, but will have to apply them in a new way.
- Sometimes, it will be hard. That's okay!
- Research shows these kind of activities lead to deeper learning.

Teams

- I have organized you into teams.
- I did this pseudo-randomly, ensuring a mix of majors on each team.

Team Names

- Introduce yourselves to each other
- Decide on a name for your team

Team and Class Norms

In your teams, come up with a list of norms you would like your team (and the class to follow)

What things do you want your teammates to do this semester, and what should they expect of you?

Class Communication Plan

How do we want to communicate with each other outside of class?

Some options used in the past:

- Canvas
- Discord
- Slack
- GroupMe

Participation Norms

In your teams, come up with a list of ways you can participate and contribute in class.

- How might you participate during class?
- How might you participate if you can't come to class?
- How might you contribute between class meetings?

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Your main job in this course is to **learn the covered material** and **demonstrate that learning to me**.

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You will be given several opportunities to demonstrate your learning throughout the semester, and if at first you don't succeed, you can try again without any penalty.

SBG is different!

SBG has many advantages

- You can learn and demonstrate learning at **your** pace, not the instructor's.
- No high stakes exams – you can always reassess at a later date.
- You can demonstrate mastery in multiple ways.

But it's different!

- Some students take some time to adjust. Unlike many courses you have taken before, **you will not succeed by only accumulating partial understanding.**
- The best advice former students give is to not delay in demonstrating your learning

SBG

The course material is broken down into 24 learning **standards**.

- Each attempted exercise will be simply marked according to whether or not your solution **demonstrates excellence** of the relevant standards.
- Your grade is calculated based on how many standards you demonstrate excellence of **twice**.
- Standards will be assessed several times, and there's no penalty for incorrect solutions. So, if you don't succeed the first time, keep practicing and try again!

Assessment Opportunities

Checkmarks may be earned as follows.

- **Quizzes**: Most weeks, we will have a quiz (usually on TBD).
- **Exams**: Periodically we will have longer assessments (usually on TBD).
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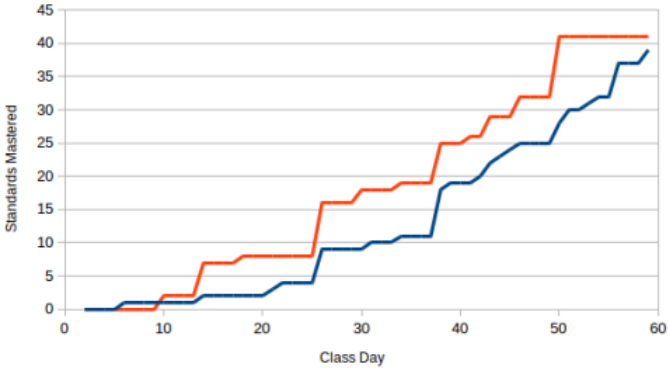
The assessment method (quiz/exam/etc.) you used to earn a checkmark isn't important: **I only care that you learn the material and demonstrate that learning to me before the end of the semester!**

A tale of two students

These two students took very different paths, but both earned the same grade.



Interpreting Feedback

On each assessment, for each standard you will receive one of the following marks.

- **Demonstrated Excellence**: Great job! Check off another box on your progress sheet.
- **Minor Revision Needed** means you have a minor mistake, unrelated to the standard. Often these are arithmetic mistakes or notation errors. You can rework the same problem, fixing your mistakes, and resubmit to demonstrate mastery.
- **Reassessment Needed** means you made a good faith effort and demonstrated partial understanding, but not complete mastery. You will need to **reassess** on the next quiz, exam, and/or in an on demand reassessment.

Course Grades

A	Demonstrate excellence twice on 22 standards
B	Demonstrate excellence twice on 20 standards
C	Demonstrate excellence twice on 17 standards
D	Demonstrate excellence twice on 15 standards

Other Assessments

In addition to mastering content, I will ask you to do some other things because experience shows these help students learn.

- Individual & Team Readiness Assurance Checks
- Reflections
- Homework
- Final

Student Hours (Office Hours)

Student Hours are meant to be for the following things (among others):

1. Questions
2. Conversations
3. Feedback

Student Hours are TR 9-9:30, 10:45-11, 12:15-1 and Wednesday 12-3. My office is 306 MSPB.

Homework

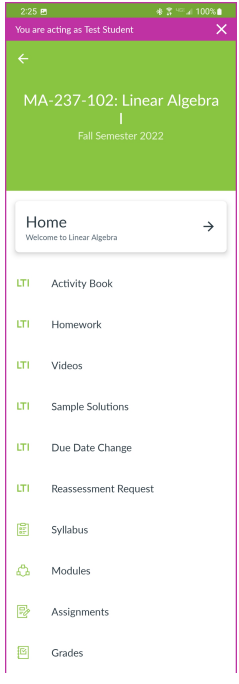
Homework is practice. A link to homework exercises, organized by standard, is available in Canvas.

- I will not collect or grade homework.
- You will need to submit 3 homework problems in order to complete an on-demand reassessment
- If you need help or feedback, come to my student hours

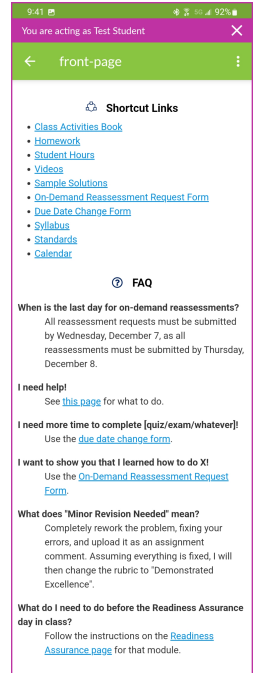
Rescheduling Due Dates

Use the form in Canvas whenever you need to reschedule a due date.

Canvas


2:25
100%
You are acting as Test Student
MA-237-102: Linear Algebra I
Fall Semester 2022
Home
Welcome to Linear Algebra
LTI Activity Book
LTI Homework
LTI Videos
LTI Sample Solutions
LTI Due Date Change
LTI Reassessment Request
Syllabus
Modules
Assignments
Grades

Canvas


9:41
92%
You are acting as Test Student
front-page
Shortcut Links
Class Activities Book
Homework
Student Hours
Videos
Sample Solutions
On-Demand Reassessment Request Form
Due Date Change Form
Syllabus
Standards
Calendar
FAQ
When is the last day for on-demand reassessments?
All reassessment requests must be submitted by Wednesday, December 7, as all reassessments must be submitted by Thursday, December 8.
I need help!
See this page for what to do.
I need more time to complete [quiz/exam/whatever]!
Use the due date change form.
I want to show you that I learned how to do X!
Use the On-Demand Reassessment Request Form.
What does "Minor Revision Needed" mean?
Completely rework the problem, fixing your errors, and upload it as an assignment comment. Assuming everything is fixed, I will then change the rubric to "Demonstrated Excellence".
What do I need to do before the Readiness Assurance day in class?
Follow the instructions on the Readiness Assurance page for that module.

Questions

- Do you have office hours?
- Do I need the textbook?
- How does linear algebra have real world applications?
- How will class operate?
- What is the difference between linear algebra and algebra?

Reminder

The first Readiness Assurance Day is Thursday!