SUNY Old Westbury, Fall 2023

MA 3160 Linear Algebra

Syllabus

(Last revised: August 29, 2023)

Instructor: Yogesh More **Email:** morey@oldwestbury.edu **Class meeting times:** 11:20 am - 12:50 pm MW

This course will include additional opportunities for student learning and direct instruction, including YouTube videos embedded in the course textbook (see below)"

Zoom link for class meetings:

See Brightspace

Office Hours:

via Zoom. Friday 3pm-6pm. Email in advance to set up an appointment.

Course description:

An introduction to linear algebra beginning with two and three dimensional spaces, and including such topics as matrices, systems of equations, determinants, vector spaces, linear transformations, eigenvalues, and applications

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Textbook:

- Clontz, Steven et. al. Linear Algebra for Team-Based Inquiry Learning:
  - https://teambasedinquirylearning.github.io/linear-algebra/
  - **Homework worksheets to turn in are here**: (select learning outcome first) https://teambasedinquirylearning.github.io/linear-algebra/2023/exercises/#/bank/

Learning Outcomes

Chapter 1: Systems of Linear Equations (LE)

LE 1. Translate back and forth between a system of linear equations, a vector equation, and the corresponding augmented matrix. **LE 2**. Explain why a matrix isn't in reduced row echelon form, and put a matrix in reduced row echelon form. **LE 3**. Determine the number of solutions for a system of linear equations or a vector equation. **LE 4**. Compute the solution set for a system of linear equations or a vector equation with infinitly many solutions.

Chapter 2: Euclidean Vectors (EV)

EV 1 Determine if a Euclidean vector can be written as a linear combination of a given set of Euclidean vectors by solving an appropriate vector equation.

EV 2 Determine if a set of Euclidean vectors spans by solving appropriate vector equations.

(skip **EV3**)

EV 4 Determine if a set of Euclidean vectors is linearly dependent or independent by solving an appropriate vector equation.

EV 5 Explain why a set of Euclidean vectors is or is not a basis of .

EV 6 Compute a basis for the subspace spanned by a given set of Euclidean vectors, and determine the dimension of the subspace.

EV 7 Find a basis for the solution set of a homogenous equations

Chapter 3 Algebraic Properties of Maps (AT)

AT 1. Determine if a map between vector spaces of polynomials is linear or not. **AT 2**. Translate back and forth between a linear transformation of Euclidean spaces and its standard matrix, and perform related computations. **AT 3**. Compute a basis for the kernel and a basis for the image of a linear map, and verify that the rank-nullity theorem holds for a given linear map. **AT 4** Determine if a given linear map is injective and/or surjective. **AT 5**. Explain why a given set with defined addition and scalar multiplication does satisfy a given vector space property, but nonetheless isn't a vector space. **AT 6** Answer questions about vector spaces of polynomials or matrices.

Chapter 4 Matrices (MX)

MX 1 Multiply matrices. **MX 2**. Determine if a matrix is invertible, and if so, compute its inverse. **MX 3**. Invert an appropriate matrix to solve a system of linear equations. **MX 4** Express row operations through matrix multiplication.

Chapter 5 Geometric Properties of Linear Maps (GT)

GT 1. Describe how a row operation affects the determinant of a matrix. **GT 2**. Compute the determinant of a 4×4 matrix. **GT 3**. Find the eigenvalues of a 2×2 matrix. **GT 4**. Find a basis for the eigenspace of a 4×4 matrix associated with a given eigenvalue.

Supplementary Resources:

- My lecture notes based on teaching out of Howard Anton's textbook listed below are here:

  https://github.com/morey-ow/ma3160-fall2023/tree/main/lecture%20notes

- Anton, Howard. *Elementary Linear Algebra*. 12th edition.
    - Too expensive so I quit using it.
- Misseldine, Andrew. *Linear Algebra Done Openly.*
    - Lots of worked examples, and answers to all exercises.

- Nicholson. *Linear Algebra with Applications*.
    - A traditionally formatted textbook
- Margalit, Dan and Rabinoff, Joe. *Intereactive Linear Algebra*
    - Nice interactive web interface for 3D plots
    - https://textbooks.math.gatech.edu/ila/
    - very concise
- Cohen, Mike. *Linear Algebra: Theory, Intuition, Code*.
    - Written for non-math majors
    - I used it last semester but not enough exercises

Course Website:

Course Materials: https://github.com/morey-ow/ma3030-fall2023

Brightspace/D2L: mylearning.suny.edu

Assignments/Grading

Each learning outcome worksheet is worth 5 points total. I will do a version of each worksheet in class, but you must do another version.

The **website gives answers to all the questions** (that is in part on reason I chose it), but you **must** give explanations or justification. **Submissions that have answers without appropriate justification will receive zero points**.

	Points
Chapter 1 Learning Outcomes (4)	20
Chapter 2 Learning Outcomes (6)	30
Chapter 3 Learning Outcomes (6)	30
Chapter 4 Learning Outcomes (4)	20
Chapter 5 Learning Outcomes (4)	20
Midterm Exam	10
Final Exam	10
Total	140

For various reasons, I have abandoned giving timed written exams, for better or worse.

Late work policy

I don't accept any late work. See Brightspace for exact deadlines, but they generally will be a week after the learning outcome worksheet in question is covered and assigned.

Academic Integrity

For your own benefit, please do each assignment mostly on your own. I do a version of each one in class for you, so this really is not asking much. It is ok to ask for help on occasion if you are stuck. **But definitely do not copy work from someone/somewhere else**. I reserve the right to ask you to meet with me over Zoom and explain your answers at any time. If you cannot explain your answers, I reserve the right to give you an F for the course.

The college's policy on academic integrity also applies to this course https://www.oldwestbury.edu/policies/academicresearch/policy-academic-integrity Here are some excerpts from that policy:

> As members of the Old Westbury community, students are expected to adhere to standards of honesty and ethical behavior. Plagiarism and other types of academic dishonesty are condemned at all academic institutions. These acts detract from the student's intellectual and personal growth by undermining the processes of higher learning and the struggle with one's own expression of ideas and information. Good academic procedure requires giving proper credit when using the words or ideas of others.

> Plagiarizing means "presenting somebody else's words or ideas without acknowledging where those words and ideas come from" (Ann Raimes, Keys for Writers, 7th ed., p.135). Examples include:
>
> - copying material from the Internet or other sources and presenting it as one's own
> - using any author's words without quotation marks; using any quotation without credit
> - changing any author's words slightly and presenting them as one's own
> - turning in any assignment containing material written by someone else (including tutor or friend); buying work and submitting it as one's own

> Know what plagiarism is and how to avoid it; for guidance see Raimes or any other college writing handbook.

Course Policy on Usage of AI Chatbots or Codelike ChatGPT, Bard, Bing, GitHub Copilot, etc.

AI Chatbots can be helpful in learning.

AI Chatbots sometimes give inaccurate, incomplete, outdated, or outright false responses in an *extremely confident* tone, so use with caution and DO NOT BLINDLY TRUST THEM! In particular, because they by and large are roughly autocomplete on steroids, they generally struggle with arithmetic (surely they are getting better)

That being said, I allow their use in a limited and appropriate way - namely as a tool to help you learn. However they can also be used as a tool to avoid learning, to avoid engaging with the material, etc., and you are cheating yourself if you use tools this way.

Here are some appropriate ways to use them:

- You can ask it to test your understanding of course material: e.g. ask it to make up quiz questions on concepts you just learned
- Ask it to explain something (e.g. a procedure such as the relationship between a linear transformation and a matrix)

For this course, you must understand and be able to explain (at an appropriate level) anything you submit, whether the material is your own or you get it from classmate, internet, textbook, AI chatbots, etc.

Accommodations for students with disabilities

If you have or suspect you may have a physical, psychological, medical or learning disability that may impact your course work, please contact Stacey DeFelice, Director, The Office of Services for Students with Disabilities (OSSD), NAB 2065, Phone: 516-628-5666, Email: defelices@oldwestbury.edu. The office will help you determine if you qualify for accommodations and assist you with the process of accessing them. All support services are free and all contacts with the OSSD are strictly confidential. SUNY Old Westbury is committed to assuring that all students have equal access to all learning activities and to social activities on campus. https://www.oldwestbury.edu/academics/support/OSSD

Title IX, Sexual discrimination, harassment, and violence

SUNY Old Westbury prohibits sexual discrimination, harassment and violence, and will promptly respond to all complaints. The purpose of Title IX is to prevent sex discrimination on campus, address reported assaults and incidents, limit the effects of harassment on the educational environment, and prevent its recurrence. If you or someone you know believes they have been subjected to sexual discrimination, harassment or violence, help is available. To report or for more information please visit https://www.oldwestbury.edu/title-ix, please contact the Title IX coordinator, Deputy Title IX coordinator or University Police at 516-876-3333. Confidential resources and support is also available from the counseling professionals in the Counseling and Psychological Wellness Services department, located in the Student Union Lower Level Room LL100 (off the Rotunda) at 516-876-3053.

Dean of Students and Deputy Title IX Coordinator Student Union Suite 303 Phone: 516-876-3067

The syllabus is subject to change at the instructor's discretion to accommodate the needs of the class.