

MATH 260: LINEAR ALGEBRA

Spring 2023: Section 1

<u>Instructor Information</u>		<u>Course Information</u>	
Name:	Dr. Christina Durón	Days:	MTRF
Email:	christina.duron@pepperdine.edu	Time:	1:00PM – 1:50PM
Office:	RAC 105	Location:	RAC 175
Office Phone:	(310) 506 – 4832	Module:	In-person

Course Pages:

1. Courses (Required): <https://courses.pepperdine.edu>
2. Gradescope (Required): <https://www.gradescope.com>
3. Homepage (Optional): <https://cduron.info>

Office Hours: Office Hours will be held regularly in RAC 105 on

- Mondays and Fridays: 2:00PM – 3:00PM
- Tuesdays and Thursdays: 10:30AM – 11:30AM
- By appointment

In addition, questions may be addressed through email between 8AM – 5PM (PST) during the academic week. Please allow up to 24 hours for a response, although the instructor will strive to reply promptly.

Required Course Materials:

- *Textbook:* The course textbook (electronic or hardcover) is *Linear Algebra and Its Applications*, 6th Edition by David C. Lay, Steven R. Lay, and Judi J. McDonald. It is important that you *read the sections in addition to attending lectures and doing assigned work*.
- *Calculator:* Most problems can be done by hand, but there may be occasional use of computational aids. A graphing calculator or computational apps such as Desmos (<https://www.desmos.com/>) are not allowed on exams but may quicken some homework calculations. Ask your professor to know when it is okay to use such apps; you do not need to purchase any software for this class! Scientific non-graphing calculators will often be allowed on exams; when allowed, these will be provided or you may use your own. These are to be used to aid computations, not as a crutch, and you are expected to know (and show!) how to do problems without these aids as well. A phone, tablet, or other WiFi device can never be used on an exam.
- *Software:* For this course, you will need daily access to a device with a reliable internet signal that can:
 - Access Courses
 - Access Gradescope
 - Scan and upload written work to Gradescope
 - View and download PDF documents

Course Communications: All course materials will be posted on Courses. Email, in-class announcements, and Courses announcements will be the primary methods to communicate course information. It is ultimately the student's responsibility to keep informed of any announcements, syllabus adjustments, or policy changes made during scheduled classes, by email, or through Courses.

Course Prerequisites: The enrollment requirement includes successful completion of or concurrent enrollment in Multivariable Calculus (Math 250), where successful completion requires a grade of C– or better.

Course Description: Math 260 provides an introduction to Linear Algebra, covering much of Chapters 1 – 7. Topics covered include systems of linear equations and linear transformations; matrix determinant, inverse, rank, eigenvalues, eigenvectors, factorizations, diagonalization, singular value decomposition; linear independence, vector spaces and subspaces, bases, dimensions; inner products and norms, orthogonal projection, Gram-Schmidt process, least squares; applications.

Course Objectives:

1. Demonstrate an understanding of the skills and concepts central to Linear Algebra.
2. Demonstrate the ability to apply appropriate mathematical ideas from Linear Algebra to both theoretical and practical contexts.
3. Demonstrate the ability to formulate logical arguments and proofs that make use of appropriate mathematical language and notation.
4. Demonstrate the ability to solve problems using the ideas of Linear Algebra including the ability to translate problems into mathematical notation and interpret solutions appropriately.

Student Learning Outcomes: Upon completing this course, students should be able to:

1. Use Gaussian elimination to solve linear systems, find inverses, compute determinants, and determine the rank and fundamental subspaces associated with a matrix.
2. Give examples that demonstrate specific properties of linear systems, matrices, vector spaces, bases, linear transformations, and inner product spaces.
3. Construct proofs that verify a vector space or subspace, linear transformation, or inner product space.
4. Understand the relationships between span, linear independence, rank, dimension, and basis.
5. Understand the various properties that are equivalent to a matrix being invertible.
6. Find the kernel, range, and matrix representation of a linear transformation.
7. Calculate the eigenvalues and eigenvectors of a matrix and if possible, use them to diagonalize the matrix.
8. Understand the relationship between inner products, projections, and orthogonality, and use Gram-Schmidt to find orthogonal bases for a given set of vectors.
9. Use ideas learned in a variety of applications, including Markov Chains, least squares problems, and singular value decomposition.

Relation to Mathematics Program Learning Outcomes: A student who completes a mathematics degree should be able to:

- Formulate mathematical proofs that are clear, correct, complete, and logical (see especially SLOs 2, 3, and 5).
- Use appropriate mathematical ideas in applied or real-world contexts (see all SLOs).
- Integrate mathematical ideas from multiple courses to solve advanced problems (see especially SLO 9).

Relation to Pepperdine's Mission: Pepperdine is a Christian university committed to the highest standards of academic excellence and Christian values, where students are strengthened for lives of purpose, service, and leadership. This course is designed to complement and supplement the overall mission of Pepperdine. Mathematics courses have historically been used to “train the mind” of students, to help students think more carefully and clearly. In logical preparation and in application of concepts, the study of mathematics helps prepare you for a life of purpose, service, and leadership.

Attendance and Class Participation Policy: Participating in the course and attending lectures and other course events are vital to the learning process. As a result, students are expected to attend each class meeting and to arrive on time and ready to participate in discussion or group work with their peers. Students are responsible for the material covered if they are late or absent. If you are unexpectedly absent for medical or personal reasons, please inform the instructor within 24 hours, if at all possible.

Classroom Behavior Policy: To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a webpage, making phone calls, web surfing). Students are asked to refrain from disruptive conversations during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion, and may be reported to the Divisional Dean.

Gradescope: Students are expected to create an account with Gradescope, linked to your @pepperdine.edu address. If you already have a Gradescope account linked to your @pepperdine.edu address, then you do not need to create another account. Students are expected to read the [guide for submitting work](#) to Gradescope. To upload your work, log into your Gradescope account, find the course Gradescope page, select the correct assignment, and upload your scanned work as a [PDF file](#). If you cannot find the course Gradescope page, then you may need a course entry code (provided on Courses under Resources).

Assignments and Examinations:

- **Quizzes** will be distributed electronically on Gradescope every Friday, with the exception of examination weeks. Each quiz will be made available at 12AM (PST) and close at 11:59PM (PST) that same day. When a quiz is started, it must be completed on Gradescope within 25 minutes (unless otherwise stated). Each quiz will be worth 5 points. Students may use the textbook, class notes, and a graphing calculator on all quizzes, but peer collaboration and the use of unapproved sources (e.g., the internet, cell phone) of any kind are not allowed.
- **Homework** will be distributed electronically on Gradescope, based on the problems from the textbook. Students are responsible for completing the online assignments on Gradescope by 11:59PM (PST) on the indicated due date (unless otherwise stated). Work for each problem can be saved online, and the assignment may be submitted an unlimited number of times before the deadline.
 - For a subset of problems (short answer, multiple choice, and select all), you do not need to write up or explain your work. These problems are labelled with [Input], [Multiple Choice], and [Select All] and will be graded on correctness. Gradescope may be sensitive to [Input] questions requiring short answers; for example, if you find your solution results in an integer, such as 2, enter 2 instead of 2.0.
 - * Some [Input] questions require a free-response, rather than a short answer. For these problems, you will be asked to explain your work. These problems will be graded on both completeness and correctness.
 - For others, you need to write your solution on a page by itself, and upload it as a separate [PDF file](#) to Gradescope (either typed or scanned from handwritten work). *Improperly submitted homework (such as submitting the wrong file type) might not receive credit, as it is time-consuming to remedy.* You should write your solutions to these problems neatly and carefully, and provide full justification for your answers. No credit will be given if the solution is not justified, or if the work is illegible. These problems are labeled with [Upload] and will be graded on both completeness and correctness.

You are strongly encouraged to work with other students in doing the homework, but the homework turned in must be your own and represent your own thinking and your own work. Turning in the work of others, allowing others to copy your work, or copying from a solutions manual or other source is a violation of Seaver College' Code of Ethics (see your student handbook for more information). This can lead to a lowering of your course grade as well as counting as one of two ethics violations allowed at Seaver College. *Please be aware that checking unsanctioned online sources for solutions is not allowed and may be reported as cheating.* On each assignment, you will be asked to provide your collaborators.

- **Midterms** will be taken during the class period. Please refer to the calendar for the dates of these three exams. Each exam will be written to be completed within 45 minutes. See the cover page on each exam for specific instructions about the use of notes and technology.
- The **Final Exam** will take place on Monday, April 24, 2023, at 1:30PM – 4:00PM in our regular classroom. The grading policy for the midterm exams will be observed for the final exam. Please visit [Final Exams and Schedule of Classes](#) for more information.
 - All students enrolled in the course must take the final exam at the scheduled time. Exceptions are only granted if a student has two exams scheduled at the same time, or three exams scheduled on the same day. Students in these situations are expected to notify the instructor at least three weeks in advance.
- **Participation** is a vital component of class success. Students are expected to keep up with class, engage and participate both in large class discussions and group work, and in general contribute to a sense of classroom community. The participation grade is meant to encourage and reward class-wide (rather than individual) efforts to create a sense of classroom community so that this course can be effective, regardless of course modality. If each of you do all you can every day to participate as you are able, this can be a great course with everyone receiving 100% for participation. However, if you personally stop regularly attending and participating in class (without excused reasons) or if too few students participate for the course to run smoothly and effectively, I reserve the right to implement individual or group participation requirements.

Important Dates:

Last day of Add/Drop period	January 13, 2023
Withdraw period begins	January 14, 2023
Last day to change Cr/NC status	January 23, 2023
Midterm #1	February 6, 2023 (<i>tentative</i>)
Last day to withdraw (with W)	March 13, 2023
Midterm #2	March 20, 2023 (<i>tentative</i>)
Midterm #3	April 14, 2023 (<i>tentative</i>)
Last day to withdraw (with WP/WF)	April 14, 2023 (by 5PM)
Last day to submit Change of Final Exam form	April 14, 2023
Final Exam	April 24, 2023

Make-Up Exams and Homework Extensions: In general, there will be no make-up exams. However, in unusual circumstances beyond your control, a make-up exam may be given on a case-by-case basis. This may require providing a detailed account of the situation and, if applicable, supporting documents. Approval in these cases is at the sole discretion of the instructor and/or the Divisional Dean.

Homework assignments not turned in by the due date will receive an automatic zero. Extensions may be granted on a case by case basis, either with prior permission of the instructor (a valid reason must be given) or with the instructor's agreement in cases of emergency. In the latter case, the student must contact the instructor within 24 hours, if possible.

Dispute of Grade Policy: Any questions regarding the grading of any assignment, quiz or exam need to be cleared up within one week after the graded item has been returned.

Grading Scale and Policies: Your work in this course will be weighted as follows:

- Participation (2%)
- Quizzes (3%)
- Homework (10%)
- Midterm Exams (60%; 20% each)
- Final Exam (25%)

The weighted percentages below correspond to your final letter grade:

A: 93 – 100%	B+: 87 – 89%	C+: 77 – 79%	D+: 67 – 69%	F: 0 – 59%
A–: 90 – 92%	B: 83 – 86%	C: 73 – 76%	D: 63 – 66%	
	B–: 80 – 82%	C–: 70 – 72%	D–: 60 – 62%	

Note: No extra credit or bonus points are offered in this course.

Assistance: I will be available in my office for questions during the posted Office Hours or whenever the door is open. If you need to reach me outside of those hours, please email me to make an appointment. There will be peer tutoring available in the Student Success Center most evenings. See <https://seaver.pepperdine.edu/academics/academic-support/student-success-center/departamental-tutoring.htm> for details.

Class Expectations: It is my goal to teach you all the material necessary to be successful in this course. In return, I expect that you will show up to class on time and ready to work. We will use calculators for mathematical applications, but I expect that you will refrain from the use of cell phones, tablets or laptops unless instructed otherwise.

In order to make the class more interesting, I will alternate between lectures and group activities. We can only cover all of the material successfully in this way if you make an effort to stay on task. Working in groups is an excellent opportunity to learn from each other. You will know that you have mastered a subject when you can successfully teach that topic to a fellow student.

It is my expectation that you will spend at least two hours outside of class for every hour you spend in class studying and working on homework. If you put in eight hours a week, then you should be able to complete your assignments and study for your exams. If you do this for each class, then a 16 – 18 unit load will give you a 48 – 54 hour work week, which is not unreasonable in many professions.

As students at Pepperdine University, you are expected to approach this class with a Christian attitude. You should be willing to help your fellow classmates understand the material while working in groups or outside of class. Our classroom is a place to ask questions without feeling ashamed or looking foolish. Since your peers are entering this course with a broad spectrum of mathematical backgrounds, you should be patient with others asking questions and encourage one another in love.

As a professor at Pepperdine University, I will approach this class with a Christian attitude, viewing my role as that of a servant, being concerned first for your personal, especially intellectual, development. One of my goals is to build a community that is understanding and encourages one another. I commit to reporting grades that accurately and honestly reflect the level of work done in the class, as described in the paragraphs above.

Student Accessibility: Any student with a documented disability (chronic medical, physical, learning, psychological, or temporary) needing academic accommodations should contact the Office of Student Accessibility (Student Assistance Center, SAC – 105, Phone: (310) 506 – 6500) as early in the

semester as possible. All discussions will remain confidential. For additional information, please visit <http://www.pepperdine.edu/student-accessibility/>.

Ethics: Academic Integrity is the expression of intellectual virtue in human beings as a result of their creation in God's image. It represents the convergence of the best of the human spirit and God's spirit, which requires personal, private and community virtue. As a Christian institution, Pepperdine University arms that integrity begins in our very created being and is lived out in our academic work. In order for the code to be effective, the community must maintain its health and vitality. This requires a genuine sense of maturity, responsibility, and sensitivity on the part of every member. Each member of the Seaver College community is expected to pursue their academic work with honesty and integrity.

Academic integrity is violated when one of the following events occurs:

- Plagiarism
- Cheating
- Fabrication, or
- Facilitating Academic Dishonesty

For a more detailed description of these violations, see <http://seaver.pepperdine.edu/academicintegrity/policies/violations.htm>. All violations will be reported and handled according to the Academic Integrity Committee Procedures. In particular, any instance of cheating or plagiarism on an assignment or exam will be reported and result in no credit.

Course Evaluations: Online course evaluations are conducted for all Seaver College courses and are part of Pepperdine University's commitment to excellence in teaching and learning. The evaluations provide useful feedback that faculty and schools use to improve the quality of instruction. Each instructor receives a compilation of the anonymous responses and comments to use in evaluating their own teaching and planning future courses. Faculty do not have access to course evaluation data until all course grades are posted. The course evaluation period opens at 5PM on the WP/WF deadline day (Friday, April 14) and closes before final exams begin (3AM on Monday, April 24). To access the online course evaluation system, you may log on directly at <https://courseeval.pepperdine.edu/>.

Intellectual Property: Course materials prepared by the instructor, together with the content of all lectures and review sessions presented by the instructor, are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures and review sessions may not be modified and must not be transferred or transmitted to any other person. Electronic devices other than laptops (e.g., cell phones, PDAs, calculators, recording devices) are not to be used during lectures or exams without prior permission of the instructor.

All class lectures and materials herein, including but not limited to, pre-recorded and live lectures, live discussions and discussion boards (and recordings thereof), posted course materials, visual materials that accompany lectures/discussions, and virtual whiteboard notes (collectively "Course Intellectual Property") remain the intellectual property of the faculty member or other third-parties. No individual may record, reproduce, screenshot, photograph, or distribute any Course Intellectual Property in partial or full-format without the permission of the professor. Any violation of this policy may subject the individual to disciplinary and/or legal action.

Subject to Change Statement: Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Tentative Schedule:

MONDAY	TUESDAY	THURSDAY	FRIDAY
Jan 9th 1 Course & Gradescope Overview	10th 2 Systems of Linear Equations (Section 1.1)	12th 3 Row Reduction and Echelon Forms (Section 1.2) HW Due on GS • Section 1.1 at 11:59PM (PST)	13th 4 Row Reduction and Echelon Forms (Section 1.2) Quiz #1 Due on GS
16th 5 NO CLASS <i>Martin Luther King Day</i>	17th 6 Vector Equations (Section 1.3)	19th 7 Vector Equations (Section 1.3) HW Due on GS • Section 1.2 at 11:59PM (PST)	20th 8 The Matrix Equation (Section 1.4) Quiz #2 Due on GS
23rd 9 Solution Sets of Linear Systems (Section 1.5) HW Due on GS • Section 1.3 • Section 1.4 at 11:59PM (PST)	24th 10 Applications of Linear Systems (Section 1.6)	26th 11 Linear Independence (Section 1.7) HW Due on GS • Section 1.5 at 11:59PM (PST)	27th 12 Introduction to Linear Transformations (Section 1.8) Quiz #3 Due on GS
30th 13 The Matrix of a Linear Transformations (Section 1.9) HW Due on GS • Section 1.7 • Section 1.8 at 11:59PM (PST)	31st 14 The Matrix of a Linear Transformations (Section 1.9)	Feb 2nd 15 Matrix Operations (Section 2.1) HW Due on GS • Section 1.9 at 11:59PM (PST)	3rd 16 Midterm #1 Review Quiz #4 Due on GS

MONDAY	TUESDAY	THURSDAY	FRIDAY
6th 17 MIDTERM #1	7th 18 The Inverse of a Matrix (Section 2.2)	9th 19 Characterizations of Invertible Matrices (Section 2.3) HW Due on GS <ul style="list-style-type: none"> • Section 2.1 • Section 2.2 at 11:59PM (PST)	10th 20 Matrix Factorizations (Section 2.5)
13th 21 Introduction to Determinants (Section 3.1) HW Due on GS <ul style="list-style-type: none"> • Section 2.3 • Section 2.5 at 11:59PM (PST)	14th 22 Properties of Determinants (Section 3.2)	16th 23 Area, Volume, and Linear Transformations (Section 3.3) HW Due on GS <ul style="list-style-type: none"> • Section 3.1 • Section 3.2 at 11:59PM (PST)	17th 24 Vector Spaces and Subspaces (Section 4.1) Quiz #5 Due on GS
20th 25 Vector Spaces and Subspaces (Section 4.1) HW Due on GS <ul style="list-style-type: none"> • Section 3.3 at 11:59PM (PST)	21st 26 Null Spaces, Column Spaces, and Linear Transformations (Section 4.2)	23rd 27 Null Spaces, Column Spaces, and Linear Transformations (Section 4.2) HW Due on GS <ul style="list-style-type: none"> • Section 4.1 at 11:59PM (PST)	24th 28 Linearly Independent Sets and Bases (Section 4.3) Quiz #6 Due on GS
27th 29 NO CLASS <i>Spring Break</i>	28th 30 NO CLASS <i>Spring Break</i>	Mar 2nd 31 NO CLASS <i>Spring Break</i>	3rd 32 NO CLASS <i>Spring Break</i>
6th 33 Linearly Independent Sets and Bases (Section 4.3) HW Due on GS <ul style="list-style-type: none"> • Section 4.2 at 11:59PM (PST)	7th 34 Coordinate Systems (Section 4.4)	9th 35 Coordinate Systems (Section 4.4) HW Due on GS <ul style="list-style-type: none"> • Section 4.3 at 11:59PM (PST)	10th 36 The Dimension of a Vector Space (Section 4.5) Quiz #7 Due on GS

MONDAY	TUESDAY	THURSDAY	FRIDAY
13th 37 Rank (Section 4.6*) HW Due on GS <ul style="list-style-type: none"> • Section 4.4 • Section 4.5 at 11:59PM (PST)	14th 38 Rank (Section 4.6*)	16th 39 Applications to Markov Chains (Section 4.9*) HW Due on GS <ul style="list-style-type: none"> • Section 4.6 at 11:59PM (PST)	17th 40 Midterm #2 Review Quiz #8 Due on GS
20th 41 MIDTERM #2	21st 42 Eigenvectors and Eigenvalues (Section 5.1)	23rd 43 The Characteristic Equation (Section 5.2) HW Due on GS <ul style="list-style-type: none"> • Section 4.9 • Section 5.1 at 11:59PM (PST)	24th 44 The Characteristic Equation (Section 5.2)
27th 45 Diagonalization (Section 5.3) HW Due on GS <ul style="list-style-type: none"> • Section 5.2 at 11:59PM (PST)	28th 46 Complex Eigenvalues (Section 5.5)	30th 47 Inner Product, Length, and Orthogonality (Section 6.1) HW Due on GS <ul style="list-style-type: none"> • Section 5.3 at 11:59PM (PST)	31st 48 Orthogonal Sets (Section 6.2) Quiz #9 Due on GS
<div>Apr 3rd</div> 49 Orthogonal Sets (Section 6.2) HW Due on GS <ul style="list-style-type: none"> • Section 6.1 at 11:59PM (PST)	4th 50 Orthogonal Projections (Section 6.3)	6th 51 The Gram-Schmidt Process (Section 6.4) HW Due on GS <ul style="list-style-type: none"> • Section 6.2 • Section 6.3 at 11:59PM (PST)	7th 52 Least-Squares Problems (Section 6.5) Quiz #10 Due on GS

MONDAY	TUESDAY	THURSDAY	FRIDAY
10th 53 Applications to Linear Models (Section 6.6) HW Due on GS <ul style="list-style-type: none"> • Section 6.4 • Section 6.5 at 11:59PM (PST)	11th 54 Inner Product Spaces (Section 6.7)	13th 55 Midterm #3 Review HW Due on GS <ul style="list-style-type: none"> • Section 6.6 • Section 6.7 at 11:59PM (PST)	14th 56 MIDTERM #3
17th 57 Diagonalization of Symmetric Matrices (Section 7.1)	18th 58 The Singular Value Decomposition (Section 7.4)	20th 59 Final Exam Review HW Due on GS <ul style="list-style-type: none"> • Section 7.1 • Section 7.4 <u>at *6PM* (PST)</u>	21st 60 Final Exam Review Quiz #11 Due on GS
24th 61 FINAL EXAM 1:30PM – 4:00PM	25th 62	27th 63	28th 64

Note: This calendar is tentative. For up-to-date information, see the course page on Courses.