Math 201: Linear Algebra

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Student Help Hours (Formerly known as Office Hours) MWF noon - 1 pm, Th 1 - 2 pm, or by appointmentt. Come by my office or join me on Zoom, whichever is easier for you.

Course Description Linear algebra is a course that mixes basic equation-solving, abstract theory and deep applications. The main objects of study are vectors, matrices, and vector spaces, and we will focus on the interplay between computational and theoretical aspects of all three. This material is used in many higher level math courses as well as in many related fields.

Learning Outcomes By the end of the course, successful students will be able to:

- State and apply each of the equivalent parts of the Invertible Matrix Theorem
- Graphically analyze linear transforms
- Identify vector spaces and their dimensions
- In the context of various applications, set up systems of equations and determine the number of solutions and the implications of the form of the solution set

Course Materials Textbook: *Functional Linear Algebra* by Robbins

Important Dates We will have six in-class tests and a final exam. Each test will focus on the material learned since the last test, but will (necessarily) contain previous material. The final will be cumulative. **If you have a conflict with one of these dates please email me ASAP.**

Test 1	**Friday 9/6, in class**
Test 2	**Friday 9/20, in class**
Test 3	**Friday 10/4, in class**
Test 4	**Monday 10/28, in class**
Test 5	**Friday 11/8, in class**
Test 6	**Monday 11/25, in class**
Final Exam	**Wednesday 12/11, 2 – 5 pm**

Course Grades The final course grade is determined in the following way:

Vocab Quizzes & Activity Responses	**10%**
Homework	**20%**
Projects (5% each)	**15%**
Test 1	**5%**
Tests 2 - 6 (8% each)	**40%**
Final Exam	**10%**

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below. Attendance and class participation will be considered when determining marginal grades.

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

Attendance Policy Class attendance is expected because doing well in this class is hard if you aren't here to work on the material with us. However, life happens and sometimes you have to miss. If you know in advance you're going to miss class, make sure you turn in any work due that day (Inquire makes this easy!). Let me know if you need help learning the material we're going to cover, whether that means getting connected with someone who will share their notes or coming to office hours with questions. If you are going to miss a quiz or test, let me know as soon as you can so we can figure out how to handle

that. If you don't know in advance (because sometimes life happens unexpectedly), talk with me as soon as you can about what you can make up and how to get caught up. I will be as generous as I can while still keeping the class fair for all students.

Vocab Quizzes We will have a short weekly quiz where you will be asked to define two linear algebra vocabulary words. These quizzes are to help you stay caught up on new vocabulary words, since it is impossible to understand what is happening in class if you are not clear on the definitions of the words being used. No make up quizzes will be given, but at the end of the semester I will drop your lowest quiz score.

Co-Curricular Activities The MCSP department and Roanoke College offer many opportunities to engage with mathematical ideas outside of classes. Members of this class are encouraged to attend many of these activities, however attending at least two is mandatory. Examples include MCSP Conversation Series talks and student research showcases - if you're unsure if a given activity makes sense for this purpose, please email me to ask. After you attend (preferably within one week), submit a brief response to the activity. Each of your responses will count as a quiz grade.

Written Homework I will assign a graded homework problem each day. The homework you turn in should be a neat and organized final draft of your work, not a rough draft. Submit your homework in class OR via Inquire as a PDF or Word file. (Picture files may not allow me to give you comments, so copy/paste pictures into Word or get a PDF scanner app on your phone.) These problems are due at the beginning of the next class so you can ask questions about them before we start new material. **Since I can't accept homework turned in after we've discussed it in class, late homework will usually not be accepted.** If you are unable to complete the homework on time for some reason, please contact me about that as soon as you can so we figure out how to handle the situation. I am happy to help with these problems, but you **may not** work on them with anyone else.

Projects We will have three projects, each on an application of linear algebra. They will be extended problems written up as a paper, with emphasis placed not only on mathematical correctness but on the quality of the explanation.

Practice Problems I will assign some problems from the book for practice - see Inquire for the recommended problems from each section. These will not be collected (the answers are in the back), and they are your chance to make sure you understand the material and to get help if you realize you need it.

Expected Work Policy This course expects you to spend at least 12 hours of work each week inside and outside of class.

Mask Policy Anyone is welcome to wear a mask for some or all of the semester. **If you feel sick and plan to come to class, please wear a mask over your nose and mouth!** (The rest of the class thanks you in advance.)

Extra Resources Subject tutoring is available through the Center for Teaching and Learning (in Fintel Library).

Artificial Intelligence If you want to use generative artificial intelligence resources on a graded assignment, you will need to discuss it with me in advance. I may or may not agree depending on the assignment and your intended use. (You are welcome to use whatever resources you like on all ungraded work.)

Special Needs If you get any academic accommodations in this course, please let me know and provide your documentation as soon as you can - preferably within the first 2 weeks of the semester. (Check with the Center for Teaching and Learning for their scheduling guidelines.)

Academic Integrity I expect all of you to follow the Academic Integrity policies of Roanoke College as well as the guidelines for each assignment. All graded work should be your own work! If you ever have questions about how these policies apply to our class please contact me. Any violations of our Academic Integrity policies will automatically be turned over to the Academic Integrity Council.

Course Schedule

The following schedule is approximate and subject to change except for the test dates. It should give you an idea of the timing of the topics covered and assignments.

Day	Date	Topic	Assignments
W	A 28	Chapter 0: Motivation	
F	A 30	Section 1.1: Vector Operations	
M	S 2	Section 1.2: Span	
W	S 4	Section 1.3: Linear Independence	
F	S 6	**Test 1**	
M	S 9	Section 2.1: Linear Functions	
W	S 11	Section 2.2: Matrices	
F	S 13	Section 2.2	
M	S 16	Section 2.3: Matrix Operations	
W	S 18	Section 2.3	
F	S 20	**Test 2**	
M	S 23	Fractals	Project 1 Assigned
W	S 25	Section 2.4: Matrix Vector Spaces	
F	S 27	Section 2.4	
M	S 30	Section 2.5: Kernel and Range	Project 1 Due
W	O 2	Section 2.5	
F	O 4	**Test 3**	
M	O 7	Section 2.6: Row Reduction	
W	O 9	Section 2.7: Applications of Row Reduction	
F	O 11	Sports Ranking	Project 2 Assigned
		Fall Break	
M	O 21	Section 2.8: Solution Sets	
W	O 23	Section 2.10: Invertibility	
F	O 25	Invertible Matrix Theorem Activity	
M	O 28	**Test 4**	
W	O 30	Section 3.1: Basis and Coordinates	Project 2 Due
F	N 1	Section 3.1	
M	N 4	Section 3.2: Polynomial Vector Spaces	
W	N 6	Section 3.3: Other Vector Spaces	
F	N 8	**Test 5**	
M	N 11	Google	Project 3 Assigned
W	N 13	Section 4.1: Eigenvalues and Eigenvectors	
F	N 15	4.2: Determinants	
M	N 18	Section 4.3: Eigenspaces	Project 3 Due
W	N 20	Section 4.4: Diagonalization	
F	N 22	Section 4.5: Change of Basis Matrices	
M	N 25	**Test 6**	
		Thanksgiving Break	
M	D 2	Section 5.1: Length	
W	D 4	Section 5.2: Orthogonality	
F	D 6	Section 5.3: Orthogonal Projection	
W	D 11	**Final Exam** 2 – 5 pm	