

Math 201: Linear Algebra

Dr. Hannah Robbins Trexler 270H, x4906, robbins@roanoke.edu (email is the best way to reach me)

Office Hours Monday 1–2 pm, Tuesday 10 am – noon, Wednesday 1–2 pm, or by appointment.

Course Description Linear algebra is a course that mixes basic equation-solving, abstract theory and deep applications. The main objects of study are matrices, vectors and vector spaces, and we will focus on the interplay between computational and theoretical aspects. 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: *Linear Algebra and its Applications* by Lay, Lay, and McDonald 5th edition

Important Dates We will have three 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, but focus more heavily on material after the third test. **If you have a conflict with one of these dates please email me ASAP.**

Test 1	Monday 9/21, in class
Test 2	Wednesday 10/14, in class
Test 3	Wednesday 11/11, in class
Final Exam	Tuesday 12/15, 8:30 - 11:30 am

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

MCSP Conversations/Quizzes	7%
Homework	12%
Projects	18%
Tests (13% each)	39%
Final Exam	24%

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	

MCSP Conversations The MCSP Department offers a series of designed to appeal to a broad audience. You are invited be involved with all of these meetings; however participation in at least two of these sessions is mandatory. After attending, you will submit within one week of the presentation a one page paper reflecting on the discussion. This should not simply be a regurgitation of the content, but rather a personal response to the experience. These reaction papers will be each be counted as a quiz.

Quizzes Since knowing the mathematical vocabulary we use in class is essential to understanding the material, we will have weekly (short) vocabulary quizzes. There will be no make-up quizzes, but at the end of the semester your lowest quiz score will be dropped.

- Homework** I will assign one or two homework problems from each section which will be collected for a grade. These problems are due at the beginning of the next class. **Late homework will not be accepted.** If you have to miss class, email me your assignment or get a friend to turn in your homework for you. 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 in a paper, with emphasis placed not only on mathematical correctness but on the quality of the written explanation.
- Daily Problems** After each section I will assign some problems from the book for practice. 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. Feel free to work with other students on these problems.
- Attendance Policy** Class attendance is expected. If you do have to miss class, you are responsible for learning all material covered that day. If you have not discussed your absence with me beforehand, you will be unable to make up any work missed.
- Expected Work Policy** This course expects you to spend at least 12 hours of work each week inside and outside of class.
- Electronic Devices** On exams, you can use **only** your calculator (which cannot be a cell phone or computer). We will also use Mathematica for computationally intensive problems and projects. (Please set your cell phones on silent and leave them in your bag.)
- Special Needs** If you have a disability that may require an accommodation in this course, please let me know and provide your documentation within the first 2 weeks of the semester. I must have your documentation at least 48 hours prior to any accommodation I make. (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. 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 these 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	S 2	Section 1.1: Systems of Linear Equations	
F	S 4	Section 1.2: Row Reduction and Echelon Forms	
M	S 7	Section 1.3: Vector Equations	
W	S 9	Football Rankings	Project 1 Assigned
F	S 11	Section 1.4: Matrix Equations	
M	S 14	Section 1.5: Solution Sets of Linear Equations	
W	S 16	Section 1.7: Linear Independence	Project 1 Due
F	S 18	Review	
M	S 21	Test 1	
W	S 23	Section 1.8: Linear Transformations	
F	S 25	Section 1.9: The Matrix of a Linear Transformation	
M	S 28	Section 2.1: Matrix Operations	
W	S 30	Section 2.2: The Inverse of a Matrix	
F	O 2	Invertible Matrix Theorem Activity	
M	O 5	Ideas of 2.4 and 2.5	
W	O 7	Section 3.1: Introduction to Determinants	
F	O 9	Section 3.2: Properties of Determinants	
M	O 12	Review	
W	O 14	Test 2	
F	O 16	Fractals	Project 2 Assigned
Fall Break			
M	O 26	Section 4.1: Vector Spaces	
W	O 28	Group Vector Space Activity	
F	O 30	Section 4.1: Subspaces	
M	N 2	Section 4.2: Null and Column Spaces and Linear Transformations	Project 2 Due
W	N 4	Section 4.3: Linearly Independent Sets; Bases	
F	N 6	Section 4.4: Coordinate Systems	
M	N 9	Review	
W	N 11	Test 3	
F	N 13	Google	Project 3 Assigned
M	N 16	Section 4.5: The Dimension of a Vector Space	
W	N 18	Section 4.6: Rank	
F	N 20	4.7: Change of Basis	Project 3 Due
M	N 23	Section 5.1: Eigenvalues and Eigenvectors, 5.2: Characteristic Equation	
Thanksgiving Break			
M	N 30	Section 5.3: Diagonalization and Linear Transformations	
W	D 2	Section 5.3, Section 6.1	
F	D 4	Section 6.1: Inner Product, Length and Orthogonality	
M	D 7	Section 6.2: Orthogonal Sets	
W	D 9	Section 6.3: Orthogonal Projections	
F	D 11	Review	
Tu	D 15	Final Exam 8:30–11:30 am	