Linear Algebra
18.700 Fall Semester, 2019

General Information

Class meetings: Monday, Wednesday, and Friday 10:00–11:00, in 4-237.

Text: Sheldon Axler, *Linear Algebra Done Right*, third edition. Read the text *before* class as well as after; your understanding and your chance of catching me in a *faux pas* will both be greatly increased. I **strongly recommend** using the third edition: it is extremely different in detail from the second. You can download a pdf from the library.

Lecturer: David Vogan, 2-355. Telephone: 617-253-4991. E-mail: dav@math.mit.edu. My office hours are **Thursday 3–4, Friday 4–5**, or by appointment.

Homework: There will be nine graded problem sets; due dates **IN CLASS** are on the schedule below. **Late problem sets will not be accepted.** (Really. If you need to miss one, the grading system won't destroy you for that.)

Exams: There will be three one-hour exams during the lecture hour: Sept 27, Oct 25, and Nov 18. There will be a three-hour final exam to be scheduled by the Registrar December 16–20. All exams will be closed book.

Grading: Each hour exam will be worth 100 points, the final exam will be worth 200 points, and the problem sets will be worth about 20 points each.

Schedule

Wed 9/4	Lecture 1	Ch 1A–B	Definition of vector spaces	
Fri 9/6	Lecture 2	Ch 1C	Properties, subspaces	
Mon 9/9	Lecture 3	Ch 1C	Sums and direct sums	
Wed 9/11	Lecture 4	Ch 2A	Span and independence	
Fri 9/13	Lecture 5	Ch 2B	Bases	
Mon 9/16	Lecture 6	Ch 2C	Bases and dimension	**PS 1 due**
Wed 9/18	Lecture 7	Ch 3A–B	Linear maps, null space, range	
Fri 9/20	**Holiday**		**Study of roots**	
Mon 9/23	Lecture 9	Ch 3C	matrices	**PS 2 due**
Wed 9/25	Lecture 10	Ch 3D	invertibility, isomorphism	
Fri 9/27	Lecture 11		**Exam 1 on Chapters 1–3**	
Mon 9/30	Lecture 12	$\mathbb{F}$	Finite fields	
Wed 10/2	Lecture 13	GE	Solving systems of equations	
Fri 10/4	Lecture 14	GE	Gaussian elimination	
Mon 10/7	Lecture 15	$\mathbb{F}$	Counting matrices over $\mathbb{F}_p$	**PS 3 due**
Wed 10/9	Lecture 16	Ch 5A	Eigenvectors, invariant subspaces	
Fri 10/11	Lecture 17	Ch 5B	Upper triangular matrices	
Mon 10/14	**Holiday**		**Columbus Day**	
Wed 10/16	Lecture 18	Ch 5C	Diagonal matrices	**PS 4 due**
Fri 10/18	Lecture 19		2×2 real matrices	
Mon 10/21	Lecture 20	Ch 9A	Eigenvectors for real vector spaces	**PS 5 due**
Wed 10/23	Lecture 21	$\mathbb{F}$	Eigenvectors over $\mathbb{F}_p$	
Fri 10/25	Lecture 22		**Exam 2 on Chapters 1–5**	

Mon 10/28	Lecture 23	Ch 6A	Inner products and norms	
Wed 10/30	Lecture 24	Ch 6B	Orthogonal bases, Gram-Schmidt	
Fri 11/1	Lecture 25	Ch 6C	Orthogonal projection, minimization	
Mon 11/4	Lecture 26	Ch 7A	Adjoint, self-adjoint, normal	**PS 6 due**
Wed 11/6	Lecture 27	Ch 7B	Spectral theorem	
Fri 11/8	Lecture 28	Ch 7C	Positive operators	
Mon 11/11	**Holiday**		**Veterans Day**	
Wed 11/13	Lecture 29	Ch 7C	Isometries	**PS 7 due**
Fri 11/15	Lecture 30	Ch 7D	Polar decomposition	
Mon 11/18	Lecture 31		**EXAM 3 on Chapters 1–7**	
Wed 11/20	Lecture 32	Ch 8A	Generalized eigenspaces	
Fri 11/22	Lecture 33	Ch 8B	Generalized eigenspace decomposition	
Mon 11/25	Lecture 34	Ch 8C	Characteristic polynomial	**PS 8 due**
Wed 11/27	Lecture 35	Ch 8D	Jordan canonical form	
Fri 11/29	**Holiday**		**Thanksgiving**	
Mon 12/2	Lecture 36	Ch 10B	Determinant	**PS 9 due**
Wed 12/4	Lecture 37	Ch 10B	Calculating determinant	
Fri 12/6	Lecture 38	Ch 10B	n-dimensional volume	
Mon 12/9	Lecture 39	Ch 10A	Trace, canonical commutation relations	
Wed 12/11	Lecture 40		The rest of linear algebra, review	
week of 12/16–12/20			**Final Exam**	