






## 330 LINEAR ALGEBRA I (3+0) 3 credits

Vector analysis continued; abstract vector spaces; bases, inner products; projections; orthogonal complements, least squares; linear maps, structure theorems; elementary spectral theory; applications. Corequisite(s): MATH 283 R.

Instructor	Course Section	Time
Eric Olson	Math 330-1004 Linear Algebra	11:00-11:50am MWF AB635 due to COVID the first week is on Zoom

Class will begin at 11am...

### Course Summary:

Date	Details	Due
Mon Aug 29, 2022	 MATH 330.1006 Linear Algebra	11am to 12pm
Wed Aug 31, 2022	 MATH 330.1006 Linear Algebra	11am to 12pm
Fri Sep 2, 2022	 MATH 330.1006 Linear Algebra	11am to 12pm
Mon Sep 5, 2022	 MATH 330.1006 Linear Algebra	11am to 12pm
Wed Sep 7, 2022	 MATH 330.1006 Linear Algebra	11am to 12pm

First weeks online

live stream from the classroom...

### To register for Math 330.1006:

1. Go to <https://mlm.pearson.com/enrollment/olson90450>
2. Sign in with your Pearson student account or create your account.  
For Instructors creating a Student account, do not use your instructor credentials.
3. Select any available access option, if asked.
  - » Enter a prepaid access code that came with your textbook or from the bookstore.
  - » Buy instant access using a credit card or PayPal.
  - » Select **Get temporary access without payment for 14 days.**
4. Select **Go to my course.**
5. Select **Math 330.1006** from My Courses.

wait at least a week before paying...

If you contact Pearson Support, give them the course ID: olson90450

Please try to obtain a paper version of the textbook as well as online access, because paper is much easier to read.

You don't need the most recent edition in paper, because the most recent edition is already online.

## Grading

	Exam 1	50 points	← indicates in the list of chapters when...
	Exam 2	50 points	
Computational Problems	MyLab Math Online	50 points	} weekly
	Handwritten Homework	50 points	
	Final	100 points	
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Explanatory and theoretical		300 points total	

Goal is to reach page 448...

### Chapter 1 Linear Equations in Linear Algebra 1

#### INTRODUCTORY EXAMPLE: Linear Models in Economics and Engineering 1

✓	1.1	Systems of Linear Equations	2
✓	1.2	Row Reduction and Echelon Forms	13
✓	1.3	Vector Equations	26
✓	1.4	The Matrix Equation $Ax = b$	37
✓	1.5	Solution Sets of Linear Systems	45
✗	1.6	Applications of Linear Systems	53
✓	1.7	Linear Independence	60
?	1.8	Introduction to Linear Transformations	67
?	1.9	The Matrix of a Linear Transformation	75
✗	1.10	Linear Models in Business, Science, and Engineering	85
		Projects	93
		Supplementary Exercises	93

## Chapter 2 Matrix Algebra 97

**INTRODUCTORY EXAMPLE: Computer Models in Aircraft Design 97**

✓ 2.1	Matrix Operations	98
✓ 2.2	The Inverse of a Matrix	111
✓ 2.3	Characterizations of Invertible Matrices	121
✓ 2.4	Partitioned Matrices	126
✓ 2.5	Matrix Factorizations	132
? 2.6	The Leontief Input–Output Model	141
? 2.7	Applications to Computer Graphics	147

For some thing different

## Chapter 3 Determinants 171

**INTRODUCTORY EXAMPLE: Weighing Diamonds 171**

✓ 3.1	Introduction to Determinants	172
✓ 3.2	Properties of Determinants	179
✓ 3.3	Cramer's Rule, Volume, and Linear Transformations	188
	Projects	197
	Supplementary Exercises	197

Is this Determinant chapter early because of corequisites?

short

Spiral method of teaching...

Chapter 4  
could follow  
2 directly

note determinants used to be a main topic in Linear Algebra...not so much now, because they are not very useful for practical computations...

## Chapter 4 Vector Spaces 201

**INTRODUCTORY EXAMPLE: Discrete-Time Signals and Digital Signal Processing 201**

✓ 4.1	Vector Spaces and Subspaces	202
✓ 4.2	Null Spaces, Column Spaces, Row Spaces, and Linear Transformations	211
✓ 4.3	Linearly Independent Sets; Bases	222
? 4.4	Coordinate Systems	231
✓ 4.5	The Dimension of a Vector Space	241
? 4.6	Change of Basis	249
<del>4.7</del>	Digital Signal Processing	255
<del>4.8</del>	Applications to Difference Equations	262
	Projects	271

## Chapter 5 Eigenvalues and Eigenvectors 273

INTRODUCTORY EXAMPLE: Dynamical Systems and Spotted Owls 273

- ✓ 5.1 Eigenvectors and Eigenvalues 274
- ✓ 5.2 The Characteristic Equation 282
- ✓ 5.3 Diagonalization 290
- ✓ 5.4 Eigenvectors and Linear Transformations 297
- ✓ 5.5 Complex Eigenvalues 304
- ? 5.6 Discrete Dynamical Systems 311
- ~~5.7~~ Applications to Differential Equations 321
- ~~5.8~~ Iterative Estimates for Eigenvalues 329
- ~~5.9~~ Applications to Markov Chains 335
- Projects 345
- Supplementary Exercises 345

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285

Note this is a difficult problem, primarily because it is not a linear system but somehow quadratic...

How computers find eigenvalues  
Math 466

## Chapter 6 Orthogonality and Least Squares 349

INTRODUCTORY EXAMPLE: Artificial Intelligence and Machine Learning 349

- ✓ 6.1 Inner Product, Length, and Orthogonality 350
- ✓ 6.2 Orthogonal Sets 358
- ✓ 6.3 Orthogonal Projections 367
- ✓ 6.4 The Gram-Schmidt Process 376
- ✓ 6.5 Least-Squares Problems 382
- ~~6.6~~ Machine Learning and Linear Models 390
- ~~6.7~~ Inner Product Spaces 399
- ~~6.8~~ Applications of Inner Product Spaces 407
- Projects 413
- Supplementary Exercises 414

optimization problems quite important for applications...

## Chapter 7 Symmetric Matrices and Quadratic Forms 417

INTRODUCTORY EXAMPLE: Multichannel Image Processing 417

- ✓ 7.1 Diagonalization of Symmetric Matrices 419
- ~~7.2~~ Quadratic Forms 425
- ~~7.3~~ Constrained Optimization 432
- ✓ 7.4 The Singular Value Decomposition 439
- 7.5 Applications to Image Processing and Statistics 449
- Projects 457
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