Table of contents

- Note: All relevant chapters end with Supplementary Exercises.
- 1 Linear Equations and Matrices
- Systems of Linear Equations
- Matrices
- Matrix Multiplication
- Algebraic Properties of Matrix Operations
- Special Types of Matrices and Partitioned Matrices
- Matrix Transformations
- Computer Graphics
- Correlation Coefficient (Optional)
- 2 Solving Linear Systems
- Echelon Form of a Matrix
- Elementary Matrices: Finding A-1
- Equivalent Matrices
- LU-Factorization (Optional)
- 3 Real Vector Spaces
- Vectors in the Plane and in 3-space
- Vector Spaces
- Subspaces
- Span and Linear Independence
- Basis and Dimension
- Homogeneous Systems
- Coordinates and Isomorphisms
- Rank of a Matrix
- 4 Inner Product Spaces
- Standard Inner Product on R2 and R3
- Cross Product in R3 (Optional)
- Inner Product Spaces
- Gram-Schmidt Process
- Orthogonal Complements
- Least Squares (Optional)
- 5 Linear Transformations and Matrices
- Definition and Examples
- Kernel and Range of a Linear Transformation
- Matrix of a Linear Transformation
- Vector Space of Matrices and Vector Space of Linear Transformations (Optional)
- Similarity
- Inroduction to Homogeneous Coordinates (Optional)
- 6 Determinants
- Definition
- Properties of Determinants
- Cofactor Expansion

- Inverse of a Matrix
- Other Applications of Determinants
- Determinants from a Computational Point of View
- 7 Eigenvalues and Eigenvectors
- Eigenvalues and Eigenvectors
- Diagonalization and Similar Matrices
- Stable Age Distribution in a Population
- Markov Processes (Optional)
- Diagonalization of Symmetric Matrices
- Spectral Decomposition and Singular Value Decomposition (Optional)
- Real Quadratic Forms
- Conic Sections
- Ouadric Surfaces
- Dominant Eigenvalue and Principal Component Analysis (Optional)
- 8 Differential Equations (Optional)
- Differential Equations
- Dynamical Systems
- 9 MATLAB for Linear Algebra
- Input and Output in MATLAB
- Matrix Operations in MATLAB
- Matrix Powers and Some Special Matrices
- Elementary Row Operations in MATLAB
- Matrix Inverses in MATLAB
- Vectors in MATLAB
- Applications of Linear Combinations in MATLAB
- Linear Transformations in MATLAB
- MATLAB Command Summary
- 10 MATLAB Exercises
- Appendix A Preliminaries Sets Functions
- Appendix B Complex Numbers Complex Numbers in Linear Algebra
- Appendix C Introduction to Proofs
- Answers to Odd-Numbered Exercises
- Index