Applied Linear Algebra

1 Matrices and Gaussian Elimination

1.2 The Geometry of Linear Equations

1.3 Gaussian Elimination

1.4 Matrix Notation and Matrix Multiplication

1.5 Triangular Factors and Row Exchanges

1.6 Inverses and Transposes

1.7 Special Matrices and Applications

Chapter 1 Review Exercises

2 Vector Spaces

2.1 Vector Spaces and Subspaces

2.2 Solving Ax = 0 and Ax = b

2.3 Linear Independence, Basis, and Dimension

2.4 The Four Fundamental Subspaces

2.5 Graphs and Networks

2.6 Linear Transformations

Chapter 2 Review Exercises

3 Orthogonality

3.1 Orthogonal Vectors and Subspaces

3.2 Cosines and Projections onto Lines

3.3 Projections and Least Squares

3.4 Orthogonal Bases and Gram-Schmidt

3.5 The Fast Fourier Transform

Chapter 3 Review Exercises

4 Determinants

4.2 Properties of the Determinant

4.3 Formulas for the Determinant

4.4 Applications of Determinants

Chapter 4 Review Exercises

5 Eigenvalues and Eigenvectors

5.2 Diagonalization of a Matrix

5.3 Difference Equations and Powers

5.4 Differential Equations

5.5 Complex Matrices

5.6 Similarity Transformations

Chapter 5 Review Exercises

6 Positive Definite Matrices

6.1 Minima, Maxima, and Saddle Points

6.2 Tests for Positive Definiteness

6.3 Singular Value Decomposition

6.4 Minimum Principles

6.5 The Finite Element Method

7 Computations with Matrices

7.2 Matrix Norm and Condition Number

7.3 Computation of Eigenvalues

7.4 Iterative Methods for Ax = b

8 Linear Programming and Game Theory

8.1 Linear Inequalities

8.2 The Simplex Method

8.3 The Dual Problem

8.4 Network Models

8.5 Game Theory