Linear algebra

G. Hadley, Addison-Wesley, 1969

Introduction

1. Linear models
2. Linear algebra
3. Leontief's interindustry model of an economy
4. Linear programming
5. Graphical solution of a linear programming problem in two variavles
6. Regression analysis
7. Linear circuit theory
8. Other linear models
9. The road ahead

Vectors

1. Physical motivation for the vector concept
2. Operations with vectors
3. The scalar product
4. Generalization to higher dimensions
5. Generalized vector operations
6. Euclidean space and the scalar product
7. Linear dependence
8. The concept of a basis
9. Changing a single vector in a basis
10. Number of vectors in a basis for E^n
11. Orthogonal bases
12. Generalized coordinate systems
13. Vector spaces and subspaces

Matrices and determinants

1. Matrices
2. Matrix operations
3. Matrix multiplication, introduction
4. Matrix multiplication, further development
5. Vectors and matrices
6. Identity, scalar, diagonal, and null matrices
7. The transpose
8. Symmetric and skew-symmetric matrices
9. Partitioning of matrices
10. Basic notion of a determinant
11. General definition of a determinant
12. Some properties of determinants
13. Expansion by cofactors
14. Additional properties of determinants
15. Laplace expansion
16. Multiplication of determinants
17. Determinant of the product of rectangular matrices
18. The matrix inverse
19. Properties of the inverse
20. Computation of the inverse by partitioning
21. Product form of the inverse
22. Matrix series and the Leontief inverse

Linear transformations, rank, and elementary transformations

1. Definition of linear transformations
2. Properties of linear transformations
3. Rank
4. Rank and determinants
5. Elementary transformations
6. Echelon matrices and rank

Simultaneous linear equations

1. Introduction
2. Gaussian elimination
3. Cramer's rule
4. Rules of rank
5. Further properties
6. Homogeneous linear equations
7. Geometric interpretation
8. Basic solutions

Convex sets and n-dimensional geometry

1. Sets
2. Point sets
3. Lines and hyperplanes
4. Convex sets
5. The convex hull
6. Theorems on separating hyperplanes
7. A basic result in linear programming
8. Convex hull of extreme points
9. Introduction to convex cones
10. Convex polyhedral cones
11. Linear transformations of regions

Characteristic value problems and quadratic forms

1. Characteristic value problems
2. Similarity
3. Characteristic value problems for symmetric matrices
4. Additional properties of the eigenvectors of a symmetric matrix
5. Diagonalization of symmetric matrices
6. Characteristic value problems for nonsymmetric matrices
7. Quadratic forms
8. Change of variables
9. Definite quadratic forms
10. Diagonalization of quadratic forms
11. Diagonalization by completion of the square
12. Another set of necessary and sufficient conditions for positive and negative definite forms
13. Simultaneous diagonalization of two quadratic forms
14. Geometric interpretation; coordinates and bases
15. Equivalence and similarity
16. Rotation of coordinates; orthogonal transformations