Contents

CHAPTER I

Linear Programming 1

1 Introduction to Linear Programming 1
2 Linear Programs and Their Duals 12
3 How the Dual Indicates Optimality 20
4 Basic Solutions 27
5 The Idea of the Simplex Method 32
6 Separating Planes for Convex Sets 44
7 Finite Cones and the Farkas Alternative 52
8 The Duality Principle 62
9 Perturbations and Parametric Programming 68
10 The Simplex Tableau Algorithm 79
11 The Revised Simplex Algorithm 93
12 A Simplex Algorithm for Degenerate Problems 97
13 Multiobjective Linear Programming 104
14 Zero-Sum, Two-Person Games 112
15 Integer Programming: Gomory's Method 127
16 Network Flows 132
17 Assignment and Shortest-Route Problems 141
18 The Transportation Problem 156

CHAPTER II

Nonlinear Programming 177

1 Wolfe's Method for Quadratic Programming 177
2 Kuhn-Tucker Theory 190
3 Geometric Programming 205

CHAPTER III
Fixed-Point Theorems 224
1 Introduction to Fixed Points; Contraction Mappings 224
2 Garsia's Proof of the Brouwer Fixed-Point Theorem 232
3 Milnor's Proof of the Brouwer Fixed-Point Theorem 251
4 Barycentric Coordinates, Sperner's Lemma, and an Elementary Proof of the Brouwer Fixed-Point Theorem 262
5 The Schauder Fixed-Point Theorem 272
6 Kakutani's Fixed-Point Theorem and Nash's Theorem for n-Person Games 283

Index 293