CONTENTS

Notations ix

Chapter 1. Introductory Metric Topology and Euclidean *n*-Space 1

1.1. The Spaces $\mathscr{V}^n$ and $\mathscr{E}^n$ 1
1.2. Local Metric Concepts 7
1.3. Basic Categories and Relations of Metric Sets; Relative Topology 13
1.4. Boundedness, Connectedness, Compactness 20
1.5. Continuous Mappings of Metric Sets 30
1.6. Connectedness in $\mathscr{E}^1$ 40
1.7. Compactness in $\mathscr{E}^n$ 44
1.8. Basic Distance Variations, Foot in a Set, Diameter, Nearness of Sets 51

Chapter 2. The Structure of Euclidean *n*-Space 60

2.1. Linear and Planar Concepts in $\mathscr{E}^n$ 60
2.2. Angles and the Euclidean Inner Product 64
2.3. A Review of Some Basic Linear Algebra 68
2.4. Affine Concepts 80
2.5. Linear and Affine Functions and Invariants 88
2.6. Hyperplanes, Half-Spaces, Convexity 92

Chapter 3. Dimension and Basic Structure of Convex Bodies and Surfaces 106

3.1. Convex Bodies and Surfaces; Set Dimension 107
3.2. Surface Connectivity, Foot Projections 117

Chapter 4. The General Geometry of Convex Bodies **124**

4.1. Simplices; Barycentric Coordinates 124
4.2. Tangent and Supporting Hyperplanes of a Convex Surface; Regular Points, Corner Points; Hyperplane Separation of Sets 137
4.3. Widths of a Set, Support and Width Functions, Convex Hulls 147
4.4 Convex Cones; Support and Normal Cones 162

Chapter 5. Convex Spans and Independence, Related Classical Theorems **177**

5.1. The Radon Theorem and Some Helly Theorems 177
5.2. Dilatations, Centers, and Centralness 186
5.3. Extreme Points, Convex Hulls, the Theorem of Caratheodory 196

Chapter 6. Linear Combinations of Sets and the Hausdorff Metric **216**

6.1. Linear Combinations of Sets 216
6.2. Some Separation Properties 227
6.3. Hausdorff Distance, Blaschke Selection Theorem 231
6.4. Applications of the Hausdorff Metric and the Blaschke Selection Theorem 242

Index **259**