
Contents

Preface	vii
Chapter 1. Positive Matrices	1
1.1 Characterizations	1
1.2 Some Basic Theorems	5
1.3 Block Matrices	12
1.4 Norm of the Schur Product	16
1.5 Monotonicity and Convexity	18
1.6 Supplementary Results and Exercises	23
1.7 Notes and References	29
Chapter 2. Positive Linear Maps	35
2.1 Representations	35
2.2 Positive Maps	36
2.3 Some Basic Properties of Positive Maps	38
2.4 Some Applications	43
2.5 Three Questions	46
2.6 Positive Maps on Operator Systems	49
2.7 Supplementary Results and Exercises	52
2.8 Notes and References	62
Chapter 3. Completely Positive Maps	65
3.1 Some Basic Theorems	66
3.2 Exercises	72
3.3 Schwarz Inequalities	73
3.4 Positive Completions and Schur Products	76
3.5 The Numerical Radius	81
3.6 Supplementary Results and Exercises	85
3.7 Notes and References	94
Chapter 4. Matrix Means	101
4.1 The Harmonic Mean and the Geometric Mean	103
4.2 Some Monotonicity and Convexity Theorems	111
4.3 Some Inequalities for Quantum Entropy	114
4.4 Furuta's Inequality	125
4.5 Supplementary Results and Exercises	129
4.6 Notes and References	136

Chapter 5. Positive Definite Functions	141
5.1 Basic Properties	141
5.2 Examples	144
5.3 Loewner Matrices	153
5.4 Norm Inequalities for Means	160
5.5 Theorems of Herglotz and Bochner	165
5.6 Supplementary Results and Exercises	175
5.7 Notes and References	191
Chapter 6. Geometry of Positive Matrices	201
6.1 The Riemannian Metric	201
6.2 The Metric Space \mathbb{P}_n	210
6.3 Center of Mass and Geometric Mean	215
6.4 Related Inequalities	222
6.5 Supplementary Results and Exercises	225
6.6 Notes and References	232
Bibliography	237
Index	247
Notation	253