Contents

1 Algebra 1
- 1.1 Semigroups 1
- 1.2 Invertibility 3
- 1.3 Zero Divisors 5
- 1.4 Commutivity 6
- 1.5 Homomorphisms 8
- 1.6 Groups 12
- 1.7 Rings 13
- 1.8 Ideals 15
- 1.9 Fredholm Theory 18
- 1.10 Exactness 20
- 1.11 Block Structure 22
- 1.12 Linear Spaces and Algebras 25
- 1.13 Linear Operators 28
- 1.14 Hyper Exactness 31

2 Topology 35
- 2.1 Topological Spaces 35
- 2.2 Continuity 36
- 2.3 Limits 37
- 2.4 Metric Spaces 38
- 2.5 Compactness 41
- 2.6 Boundaries, Hulls and Accumulation Points 43
- 2.7 Connectedness and Homotopy 47
- 2.8 Disconnectedness 50

3 Topological Algebra 53
- 3.1 Topological Semigroups 53
- 3.2 Spectral Topology 54
- 3.3 Normed Algebra 55
- 3.4 Banach Algebra 56
- 3.5 Bounded Operators 61
- 3.6 Duality 65
- 3.7 Enlargement 69
- 3.8 Functions 72

3.9 Topological Zero Divisors 73
3.10 The Riesz Lemmas 75
3.11 Polar Decomposition 77

4 Spectral Theory 81
4.1 Spectrum 81
4.2 Left and Right Point Spectrum 83
4.3 Banach Algebra Spectral Theory 85
4.4 Approximate Point Spectrum 88
4.5 Boundary Spectrum 89
4.6 Exponential Spectrum 92
4.7 Essential Spectrum 95
4.8 Local Spectrum 97
4.9 Spectral Pictures 100
4.10 Müller Regularity 101
4.11 Numerical Range 103
4.12 Invariant Subspaces 105
4.13 Peripheral Spectrum 108

5 Several Variables 111
5.1 Non Commutative Polynomials 111
5.2 Relative and Restricted Spectrum 115
5.3 The Spectral Mapping Theorem 116
5.4 Gelfand's Theorem 118
5.5 Joint Approximate Spectrum 119
5.6 Tensor Products 120
5.7 Elementary Operators 123
5.8 Quasicommuting Systems 124
5.9 Holomorphic Left Inverses 127
5.10 Operator Matrices 129
5.11 Spectral Disjointness 133
5.12 Joint Local Spectrum 135
5.13 Taylor Invertibility 136
5.14 Fredholm, Weyl and Browder Theory 140
5.15 Joint Boundary Spectrum 143
5.16 Bass Stable Rank 144
5.17 Determinant and Adjugate 145

6 Many Variables 151
6.1 Infinite Systems 151
6.2 Vector Valued Spectra 153
6.3 Waelbroeck Algebras 157
6.4 Categories and Functors 159
6.5 Functional Calculus 161
6.6 Number Theory 162

References 169

Index 181

Symbol Index 185