

# Contents

<i>Preface</i> . . . . .	vii
<b>Chapter 1 Algebra of Sets</b>	
1.1 Sets and Subsets . . . . .	1
1.2 Operations on Sets . . . . .	4
1.3 Relations . . . . .	6
1.4 Mappings . . . . .	10
1.5 Partial Orders . . . . .	14
<b>Chapter 2 Cardinal and Ordinal Numbers</b>	
2.1 Equipotent Sets . . . . .	17
2.2 Cardinal Numbers . . . . .	21
2.3 Order Types . . . . .	26
2.4 Ordinal Numbers . . . . .	29
2.5 Axiom of Choice . . . . .	33
<b>Chapter 3 Topological Spaces</b>	
Introduction . . . . .	36
3.1 Open Sets and Limit Points . . . . .	36
3.2 Closed Sets and Closure . . . . .	39
3.3 Operators and Neighborhoods . . . . .	43
3.4 Bases and Relative Topologies . . . . .	46
<b>Chapter 4 Connectedness, Compactness, and Continuity</b>	
4.1 Connected Sets and Components . . . . .	51
4.2 Compact and Countably Compact Spaces . . . . .	56
4.3 Continuous Functions . . . . .	60
4.4 Homeomorphisms . . . . .	64
4.5 Arcwise Connectivity . . . . .	67

**Chapter 5 Separation and Countability Axioms**

5.1	$T_0$ - and $T_1$ -Spaces . . . . .	69
5.2	$T_2$ -Spaces and Sequences . . . . .	73
5.3	Axioms of Countability . . . . .	79
5.4	Separability and Summary . . . . .	84
5.5	Regular and Normal Spaces . . . . .	87
5.6	Completely Regular Spaces . . . . .	95

**Chapter 6 Metric Spaces**

6.1	Metric Spaces as Topological Spaces . . . . .	99
6.2	Topological Properties . . . . .	104
6.3	Hilbert ( $l_2$ ) Space . . . . .	108
6.4	Fréchet Space . . . . .	112
6.5	Space of Continuous Functions . . . . .	115

**Chapter 7 Complete Metric Spaces**

7.1	Cauchy Sequences . . . . .	118
7.2	Completions . . . . .	122
7.3	Equivalent Conditions . . . . .	125
7.4	Baire Theorem . . . . .	127

**Chapter 8 Product Spaces**

8.1	Finite Products . . . . .	129
8.2	Product Invariant Properties . . . . .	132
8.3	Metric Products . . . . .	135
8.4	Tichonov Topology . . . . .	138
8.5	Tichonov Theorem . . . . .	142

**Chapter 9 Function and Quotient Spaces**

9.1	Topology of Pointwise Convergence . . . . .	147
9.2	Topology of Compact Convergence . . . . .	149
9.3	Quotient Topology . . . . .	153

**Chapter 10 Metrization and Paracompactness**

10.1 Urysohn's Metrization Theorem . . . . .	158
10.2 Paracompact Spaces . . . . .	160
10.3 Nagata-Smirnov Metrization Theorem . . . . .	169

**Chapter 11 Uniform Spaces**

11.1 Quasi Uniformization . . . . .	174
11.2 Uniformization . . . . .	178
11.3 Uniform Continuity . . . . .	184
11.4 Completeness and Compactness . . . . .	188
11.5 Proximity Spaces . . . . .	193

<i>Bibliography</i> . . . . .	197
-------------------------------	-----

<i>Index</i> . . . . .	201
------------------------	-----