Contents

	Preface		
	A No	ote to the Reader	xv
PART I			1
Chapter 1.	Set I	Set Theory and Logic	
	1-1	Fundamental Concepts	4
		Functions	15
	1-3	Relations	21
	1-4	The Integers and the Real Numbers	29
	1-5	Arbitrary Cartesian Products	36
	1-6	Finite Sets	39
	1-7	Countable and Uncountable Sets	45
	*1-8	The Principle of Recursive Definition	53
	1-9	Infinite Sets and the Axiom of Choice	57
	1-10	Well-Ordered Sets	63
	*1-11	The Maximum Principle	68
*Supplementary Exercises: Well-Ordering			72

Chapter 2	2. Topological Spaces	
	and Continuous Functions	75
	2-1 Topological Spaces	75
	2-2 Basis for a Topology	73
	2-3 The Order Topology	84
	2-4 The Product Topology on $X \times Y$ 2-5 The Subspace Topology	86
	2-5 The Subspace Topology2-6 Closed Sets and Limit Points	89
	2-7 Continuous Functions	92
	2-8 The Product Topology	101 112
	2-9 The Metric Topology	112
	2-10 The Metric Topology (continued)	126
	*2-11 The Quotient Topology	134
	*Supplementary Exercises: Topological Groups	144
Chapter 3.	Connectedness and Compactness	146
	3-1 Connected Spaces	146
	3-2 Connected Sets in the Real Line	147
	*3-3 Components and Path Components	152
	*3-4 Local Connectedness	159 161
	3-5 Compact Spaces	164
	3-6 Compact Sets in the Real Line	173
	3-7 Limit Point Compactness *3-8 Local Compactness	178
	*3-8 Local Compactness *Supplementary Exercises: Nets	182
	Supplementary Exercises: Inets	187
Chapter 4.	Countability and Separation Axioms	189
	4-1 The Countability Axioms	190
	4-2 The Separation Axioms	195
	4-3 The Urysohn Lemma	207
	4-4 The Urysohn Metrization Theorem*4-5 Partitions of Unity	216
	*Supplementary Exercises: Review of Part I	222
	approximiting Exclusion. Review of Part 1	225
PART II		227
Chapter 5.	The Tychonoff Theorem	229
	5-1 The Tychonoff Theorem	
	5-2 Completely Regular Spaces	229
	5-3 The Stone-Čech Compactification	235 238
		200

Chapter 6.	Metrization Theorems and Paracompactness		
	6-1	Local Finiteness	245
	6-2	The Nagata-Smirnov Metrization Theorem	243
	02	(sufficiency)	247
	6-3	The Nagata-Smirnov Theorem (necessity)	251
	6-4	Paracompactness	254
	6-5	The Smirnov Metrization Theorem	260
Chapter 7.	Com	plete Metric Spaces	
-		and Function Spaces	
	7-1	_	262
	7-1	Complete Metric Spaces	263
	7-2	A Space-Filling Curve	271
	7-3	Compactness in Metric Spaces	274
	7-5	Pointwise and Compact Convergence The Compact-Open Topology	280
	7-6	Ascoli's Theorem	285 289
	7-7		289 293
	7-8	A Nowhere-Differentiable Function	293 297
	7-9	An Introduction to Dimension Theory	301
Chapter 8.		Fundamental Group and	501
1	Covering Spaces		316
	8-1	Homotopy of Paths	318
	8-2	The Fundamental Group	326
	8-3	Covering Spaces	331
	8-4	The Fundamental Group of the Circle	336
	8-5	The Fundamental Group of the Punctured	
		Plane	343
	8-6	The Fundamental Group of S ⁿ	348
	8-7	Fundamental Groups of Surfaces	351
	8-8	Essential and Inessential Maps	357
	8-9	The Fundamental Theorem of Algebra	361
	0 10	\mathbf{V}_{-}	

8-10	Vector Fields and Fixed Points	364
8-11	Homotopy Type	369
8-12	The Jordan Separation Theorem	374
8-13	The Jordan Curve Theorem	378
8-14	The Classification of Covering Spaces	387

Bibliography

<u>399</u>