

# Contents

## **Chapter 1 Set Theory and Metric Spaces**

1	Set theory . . . . .	1
2	Metric spaces . . . . .	15

## **Chapter 2 Topological Spaces**

3	Fundamental concepts . . . . .	23
4	Neighborhoods . . . . .	31
5	Bases and subbases . . . . .	36

## **Chapter 3 New Spaces from Old**

6	Subspaces . . . . .	41
7	Continuous functions . . . . .	44
8	Product spaces; weak topologies . . . . .	52
9	Quotient spaces . . . . .	59

## **Chapter 4 Convergence**

10	Inadequacy of sequences . . . . .	70
11	Nets . . . . .	73
12	Filters . . . . .	77

## **Chapter 5 Separation and Countability**

13	The separation axioms . . . . .	85
14	Regularity and complete regularity . . . . .	92
15	Normal spaces . . . . .	99
16	Countability properties . . . . .	108

## **Chapter 6 Compactness**

17	Compact spaces . . . . .	116
18	Locally compact spaces . . . . .	129
19	Compactification . . . . .	135
20	Paracompactness . . . . .	144
21	Products of normal spaces . . . . .	155

<b>Chapter 7 Metrizable Spaces</b>	
22 Metric spaces and metrizable spaces . . . . .	161
23 Metrization . . . . .	165
24 Complete metric spaces . . . . .	175
25 The Baire theorem . . . . .	185
<b>Chapter 8 Connectedness</b>	
26 Connected spaces . . . . .	191
27 Pathwise and local connectedness . . . . .	197
28 Continua . . . . .	203
29 Totally disconnected spaces . . . . .	210
30 The Cantor set . . . . .	216
31 Peano spaces . . . . .	219
32 The homotopy relation . . . . .	222
33 The fundamental group . . . . .	227
34 $\Pi_1(S^1)$ . . . . .	233
<b>Chapter 9 Uniform Spaces</b>	
35 Diagonal uniformities . . . . .	238
36 Uniform covers . . . . .	244
37 Uniform products and subspaces; weak uniformities . . . . .	251
38 Uniformizability and uniform metrizability . . . . .	255
39 Complete uniform spaces; completion . . . . .	260
40 Proximity spaces . . . . .	266
41 Compactness and proximities . . . . .	273
<b>Chapter 10 Function Spaces</b>	
42 Pointwise convergence; uniform convergence . . . . .	278
43 The compact–open topology and uniform convergence on compacta . . . . .	282
44 The Stone–Weierstrass theorem . . . . .	290
<b>Historical Notes</b> . . . . .	297
<b>Bibliography</b> . . . . .	323
<b>Index</b> . . . . .	345