



Contents

Foreword	vii
Preface	ix
Introduction	xi
1. Guidelines for Teachers	1
1.1 Encouraging students to learn topology	2
1.2 Starting activities for teaching topological concepts	5
2. Intuitive Set Theory	9
2.1 Concept of a set	10
2.2 Set operations	12
3. Points and Curves	19
3.1 Curve	20
3.2 Closed and open curves	22
3.3 Interior, exterior, and boundary of regions	26
3.4 Open and closed regions	29
3.5 Separation axioms	34
3.6 Bounded regions	35
3.7 Connectedness	36
3.8 Compactness	38
3.9 Euclidean three-dimensional space	39
4. Topological Equivalence and Topological Invariants	41
4.1 Topological equivalence	42
4.2 Topological invariants	46
4.3 Component number	47



4.4	Disconnecting points of curves	48
4.5	Genus number	50
4.6	Winding number	53
4.7	Graph theory	54
4.8	Möbius strip	58
4.9	Grandfather Paradox	62
4.10	Euler characteristic	64
4.11	Holes and handles	68
5.	Challenging Topics in Topology	71
5.1	Four-dimensional space	72
5.2	Knot theory	77
5.3	Fractal	86
5.4	Abstract topology	90
6.	Hints and Solutions to Activities	93
6.1	Hints and solutions for Chapter 1	94
6.2	Hints and solutions for Chapter 2	95
6.3	Hints and solutions for Chapter 3	100
6.4	Hints and solutions for Chapter 4	110
6.5	Hints and solutions for Chapter 5	115
	Bibliography	119
	Index	123
	About the Author	126