

---

# Contents

List of Figures	xi
Preface	xv
Chapter 1. Introduction	1
§1.1. The Game	1
§1.2. Interlude on Notation	5
§1.3. Lower Bounds	10
§1.4. Upper Bounds	16
§1.5. Cops, Robbers, and Retracts	20
Exercises	23
Chapter 2. Characterizations	29
§2.1. Introduction	29
§2.2. Characterizing Cop-win Graphs	30
§2.3. Characterizing Graphs with Higher Cop Number	39
Exercises	48
Chapter 3. Meyniel's Conjecture	53
§3.1. Introduction	53
§3.2. An Improved Upper Bound for the Cop Number	56
§3.3. How Close to $\sqrt{n}$ ?	62

---

§3.4. Meyniel's Conjecture in Graph Classes	66
Exercises	74
Chapter 4. Graph Products and Classes	79
§4.1. Introduction	79
§4.2. Cop Numbers and Corners in Products	83
§4.3. Covering by Cop-win Graphs	86
§4.4. Genus of a Graph	92
§4.5. Outerplanar Graphs	95
§4.6. Planar Graphs	98
Exercises	105
Chapter 5. Algorithms	109
§5.1. Introduction	109
§5.2. Background on Complexity	112
§5.3. Polynomial Time with $k$ Fixed	120
§5.4. <b>NP</b> -hard with $k$ Not Fixed	124
§5.5. Open Problems	127
Exercises	129
Chapter 6. Random Graphs	133
§6.1. Introduction	133
§6.2. Constant $p$ and $\log n$ Many Cops	136
§6.3. Variable $p$ and Bounds	139
§6.4. The Zig-Zag Theorem	149
§6.5. Cops and Robbers in the Web Graph	153
Exercises	162
Chapter 7. Infinite Graphs	165
§7.1. Introduction	165
§7.2. Introducing the Infinite Random Graph	167
§7.3. Cop Density	172
§7.4. Infinite Chordal Graphs	178

<b>Contents</b>	ix
§7.5. Vertex-transitive Cop-win Graphs	182
Exercises	187
Chapter 8. Variants of Cops and Robbers	191
§8.1. Imperfect Information	192
§8.2. Traps	199
§8.3. Tandem-win	203
§8.4. Playing on Different Edge Sets	206
§8.5. Distance $k$ Cops and Robbers	210
§8.6. Capture Time	215
Exercises	220
Chapter 9. Good Guys Versus Bad Guys	223
§9.1. Introduction	223
§9.2. Firefighter	225
§9.3. Seepage	232
§9.4. Graph Searching	235
§9.5. Helicopter Cops and Robbers and Marshals	239
§9.6. Cleaning	241
§9.7. Combinatorial Games	254
Exercises	257
Bibliography	261
Index	275