
Contents

Preface	xi
Table of Symbols	xv
Chapter 1. Population Models	1
§1.1. Linear Difference Equations	2
§1.2. Nonlinear Difference Equations	7
§1.3. Applications	31
§1.4. Concluding Remarks	37
§1.5. Exercises	37
Chapter 2. Linear Matrix Models for Structured Populations	43
§2.1. Modeling Methodology	44
§2.2. The Fundamental Theorem of Demography	50
§2.3. The Reproduction Number R_0	60
§2.4. Sensitivity and Elasticity Analysis	69
§2.5. Applications	74
§2.6. Concluding Remarks	84
§2.7. Exercises	85
Chapter 3. Nonlinear Matrix Models for Structured Populations	91
§3.1. Modeling Methodology	91

§3.2. Equilibria and the Linearization Principle	98
§3.3. The Extinction Equilibrium and Its Stability	102
§3.4. Positive Equilibria: A Basic Bifurcation Theorem	108
§3.5. Secondary Bifurcations	119
§3.6. Imprimitve Projection Matrices	134
§3.7. Applications	142
§3.8. Concluding Remarks	160
§3.9. Exercises	161
Chapter 4. Disease and Epidemic Models	167
§4.1. Preliminaries	167
§4.2. Disease-Free Equilibria and R_0	171
§4.3. Examples	172
§4.4. Endemic Equilibria: A Basic Bifurcation Theorem	182
§4.5. Applications	187
§4.6. Concluding Remarks	199
§4.7. Exercises	199
Chapter 5. Darwinian Dynamics	201
§5.1. Modeling Methodology	202
§5.2. Extinction Equilibria	214
§5.3. A Basic Bifurcation Theorem	217
§5.4. The ESS Maximum Principle	221
§5.5. R_0 for Darwinian Models	227
§5.6. Applications	231
§5.7. Concluding Remarks	250
§5.8. Exercises	251
Appendix A. Appendices	255
§A.1. Jury Conditions for 2×2 Matrices	255
§A.2. The Linearization Principle	257
§A.3. The Implicit Function Theorem	258
§A.4. Mean Trait Dynamics	259

Contents ix

Bibliography 263

Index 271