Contents

1 ▷ Functions and Their Graphs 1

1.1 Rectangular Coordinates 2
1.2 Graphs of Equations 11
1.3 Linear Equations in Two Variables 22
1.4 Functions 35
1.5 Analyzing Graphs of Functions 49
1.6 A Library of Parent Functions 60
1.7 Transformations of Functions 67
1.8 Combinations of Functions: Composite Functions 76
1.9 Inverse Functions 84
1.10 Mathematical Modeling and Variation 93
Chapter Summary 104
Review Exercises 106
Chapter Test 109
Proofs in Mathematics 110
P.S. Problem Solving 111

2 ▷ Polynomial and Rational Functions 113

2.1 Quadratic Functions and Models 114
2.2 Polynomial Functions of Higher Degree 124
2.3 Polynomial and Synthetic Division 138
2.4 Complex Numbers 147
2.5 Zeros of Polynomial Functions 154
2.6 Rational Functions 168
2.7 Nonlinear Inequalities 180
Chapter Summary 190
Review Exercises 192
Chapter Test 194
Proofs in Mathematics 195
P.S. Problem Solving 197

3 ▷ Exponential and Logarithmic Functions 199

3.1 Exponential Functions and Their Graphs 200
3.2 Logarithmic Functions and Their Graphs 211
3.3 Properties of Logarithms 221
3.4 Exponential and Logarithmic Equations 228
3.5 Exponential and Logarithmic Models 238
Chapter Summary 250
Review Exercises 252
Chapter Test 255
Cumulative Test for Chapters 1–3 256
Proofs in Mathematics 258
P.S. Problem Solving 259

4 ▷ Trigonometry **261**

4.1 Radian and Degree Measure 262
4.2 Trigonometric Functions: The Unit Circle 272
4.3 Right Triangle Trigonometry 279
4.4 Trigonometric Functions of Any Angle 290
4.5 Graphs of Sine and Cosine Functions 299
4.6 Graphs of Other Trigonometric Functions 310
4.7 Inverse Trigonometric Functions 320
4.8 Applications and Models 330
Chapter Summary 340
Review Exercises 342
Chapter Test 345
Proofs in Mathematics 346
P.S. Problem Solving 347

5 ▷ Analytic Trigonometry **349**

5.1 Using Fundamental Identities 350
5.2 Verifying Trigonometric Identities 357
5.3 Solving Trigonometric Equations 364
5.4 Sum and Difference Formulas 375
5.5 Multiple-Angle and Product-to-Sum Formulas 382
5.6 Law of Sines 391
5.7 Law of Cosines 400
Chapter Summary 407
Review Exercises 410
Chapter Test 413
Proofs in Mathematics 414
P.S. Problem Solving 419

6 ▷ Topics in Analytic Geometry **421**

6.1 Lines 422
6.2 Introduction to Conics: Parabolas 429
6.3 Ellipses 438
6.4 Hyperbolas 447
6.5 Parametric Equations 457
6.6 Polar Coordinates 467
6.7 Graphs of Polar Equations 473
6.8 Polar Equations of Conics 481
Chapter Summary 488
Review Exercises 490
Chapter Test 493
Cumulative Test for Chapters 4–6 494
Proofs in Mathematics 496
P.S. Problem Solving 499

Appendices

Appendix A: Review of Fundamental Concepts of Algebra (web)*

- **A.1** Real Numbers and Their Properties
- **A.2** Exponents and Radicals
- **A.3** Polynomials and Factoring
- **A.4** Rational Expressions
- **A.5** Solving Equations
- **A.6** Linear Inequalities in One Variable
- **A.7** Errors and the Algebra of Calculus

Appendix B: Concepts in Statistics (web)*

- **B.1** Representing Data
- **B.2** Analyzing Data
- **B.3** Modeling Data

Answers to Odd-Numbered Exercises and Tests A1
Index A69
Index of Applications (web)*

*Available at the text-specific website *www.cengagebrain.com*