

Contents

A Word from the Author (Preface) vii

chapter 1

Functions and Their Graphs 1

- 1.1 Rectangular Coordinates 2
 - 1.2 Graphs of Equations 13
 - 1.3 Linear Equations in Two Variables 24
 - 1.4 Functions 39
 - 1.5 Analyzing Graphs of Functions 54
 - 1.6 A Library of Parent Functions 66
 - 1.7 Transformations of Functions 73
 - 1.8 Combinations of Functions: Composite Functions 83
 - 1.9 Inverse Functions 92
 - 1.10 Mathematical Modeling and Variation 102
 - Chapter Summary 114
 - Chapter Test 121
 - Problem Solving 123
 - Review Exercises 116
 - Proofs in Mathematics 122
-

chapter 2

Polynomial and Rational Functions 125

- 2.1 Quadratic Functions and Models 126
 - 2.2 Polynomial Functions of Higher Degree 136
 - 2.3 Polynomial and Synthetic Division 150
 - 2.4 Complex Numbers 159
 - 2.5 Zeros of Polynomial Functions 166
 - 2.6 Rational Functions 181
 - 2.7 Nonlinear Inequalities 194
 - Chapter Summary 204
 - Chapter Test 210
 - Problem Solving 213
 - Review Exercises 206
 - Proofs in Mathematics 211
-

chapter 3

Exponential and Logarithmic Functions 215

- 3.1 Exponential Functions and Their Graphs 216
- 3.2 Logarithmic Functions and Their Graphs 227
- 3.3 Properties of Logarithms 237
- 3.4 Exponential and Logarithmic Equations 244

| | |
|---|-----|
| 3.5 Exponential and Logarithmic Models | 255 |
| Chapter Summary | 268 |
| Chapter Test | 273 |
| Proofs in Mathematics | 276 |
| Review Exercises | 270 |
| Cumulative Test for Chapters 1–3 | 274 |
| Problem Solving | 277 |

chapter 4

Trigonometry 279

| | |
|---|-----|
| 4.1 Radian and Degree Measure | 280 |
| 4.2 Trigonometric Functions: The Unit Circle | 292 |
| 4.3 Right Triangle Trigonometry | 299 |
| 4.4 Trigonometric Functions of Any Angle | 310 |
| 4.5 Graphs of Sine and Cosine Functions | 319 |
| 4.6 Graphs of Other Trigonometric Functions | 330 |
| 4.7 Inverse Trigonometric Functions | 341 |
| 4.8 Applications and Models | 351 |
| Chapter Summary | 362 |
| Chapter Test | 367 |
| Problem Solving | 369 |
| Review Exercises | 364 |
| Proofs in Mathematics | 368 |

chapter 5

Analytic Trigonometry 371

| | |
|---|-----|
| 5.1 Using Fundamental Identities | 372 |
| 5.2 Verifying Trigonometric Identities | 380 |
| 5.3 Solving Trigonometric Equations | 387 |
| 5.4 Sum and Difference Formulas | 398 |
| 5.5 Multiple-Angle and Product-to-Sum Formulas | 405 |
| Chapter Summary | 416 |
| Chapter Test | 421 |
| Problem Solving | 425 |
| Review Exercises | 418 |
| Proofs in Mathematics | 422 |

chapter 6

Additional Topics in Trigonometry 427

| | |
|---|-----|
| 6.1 Law of Sines | 428 |
| 6.2 Law of Cosines | 437 |
| 6.3 Vectors in the Plane | 445 |
| 6.4 Vectors and Dot Products | 458 |
| 6.5 Trigonometric Form of a Complex Number | 468 |
| Chapter Summary | 478 |
| Chapter Test | 484 |
| Proofs in Mathematics | 487 |
| Review Exercises | 480 |
| Cumulative Test for Chapters 4–6 | 485 |
| Problem Solving | 491 |

chapter 7**Systems of Equations and Inequalities 493**

- 7.1 Linear and Nonlinear Systems of Equations 494
 7.2 Two-Variable Linear Systems 505
 7.3 Multivariable Linear Systems 517
 7.4 Partial Fractions 530
 7.5 Systems of Inequalities 538
 7.6 Linear Programming 549
 Chapter Summary 558 Review Exercises 560
 Chapter Test 565 Proofs in Mathematics 566
 Problem Solving 567

chapter 8**Matrices and Determinants 569**

- 8.1 Matrices and Systems of Equations 570
 8.2 Operations with Matrices 584
 8.3 The Inverse of a Square Matrix 599
 8.4 The Determinant of a Square Matrix 608
 8.5 Applications of Matrices and Determinants 616
 Chapter Summary 628 Review Exercises 630
 Chapter Test 635 Proofs in Mathematics 636
 Problem Solving 637

chapter 9**Sequences, Series, and Probability 639**

- 9.1 Sequences and Series 640
 9.2 Arithmetic Sequences and Partial Sums 651
 9.3 Geometric Sequences and Series 661
 9.4 Mathematical Induction 671
 9.5 The Binomial Theorem 681
 9.6 Counting Principles 689
 9.7 Probability 699
 Chapter Summary 712 Review Exercises 714
 Chapter Test 717 Cumulative Test for Chapters 7–9 718
 Proofs in Mathematics 720 Problem Solving 723

chapter 10

Topics in Analytic Geometry 725

- 10.1 Lines 726
- 10.2 Introduction to Conics: Parabolas 733
- 10.3 Ellipses 742
- 10.4 Hyperbolas 751
- 10.5 Rotation of Conics 761
- 10.6 Parametric Equations 769
- 10.7 Polar Coordinates 777
- 10.8 Graphs of Polar Equations 783
- 10.9 Polar Equations of Conics 791
- Chapter Summary 798
- Chapter Test 803
- Problem Solving 807
- Review Exercises 800
- Proofs in Mathematics 804

Appendix A Review of Fundamental Concepts of Algebra A1

- A.1 Real Numbers and Their Properties A1
- A.2 Exponents and Radicals A14
- A.3 Polynomials and Factoring A27
- A.4 Rational Expressions A39
- A.5 Solving Equations A49
- A.6 Linear Inequalities in One Variable A63
- A.7 Errors and the Algebra of Calculus A73

Answers to Odd-Numbered Exercises and Tests A81

Index A197

Index of Applications (web)

Appendix B Concepts in Statistics (web)

- B.1 Representing Data
- B.2 Measures of Central Tendency and Dispersion
- B.3 Least Squares Regression