

Contents at a Glance

<i>Introduction</i>	1
<i>Part I: Homing in on Basic Solutions</i>	7
Chapter 1: Going Beyond Beginning Algebra.....	9
Chapter 2: Toeing the Straight Line: Linear Equations.....	23
Chapter 3: Cracking Quadratic Equations.....	37
Chapter 4: Rooting Out the Rational, Radical, and Negative.....	57
Chapter 5: Graphing Your Way to the Good Life	77
<i>Part II: Facing Off with Functions</i>	97
Chapter 6: Formulating Function Facts	99
Chapter 7: Sketching and Interpreting Quadratic Functions.....	117
Chapter 8: Staying Ahead of the Curves: Polynomials	133
Chapter 9: Relying on Reason: Rational Functions	157
Chapter 10: Exposing Exponential and Logarithmic Functions	177
<i>Part III: Conquering Conics and Systems of Equations</i> ...	201
Chapter 11: Cutting Up Conic Sections.....	203
Chapter 12: Solving Systems of Linear Equations.....	225
Chapter 13: Solving Systems of Nonlinear Equations and Inequalities	247
<i>Part IV: Shifting into High Gear with Advanced Concepts</i>	267
Chapter 14: Simplifying Complex Numbers in a Complex World.....	269
Chapter 15: Making Moves with Matrices.....	281
Chapter 16: Making a List: Sequences and Series	303
Chapter 17: Everything You Wanted to Know about Sets	323
<i>Part V: The Part of Tens</i>	347
Chapter 18: Ten Multiplication Tricks	349
Chapter 19: Ten Special Types of Numbers	357
<i>Index</i>	361

Table of Contents

.....

***Introduction*..... 1**

About This Book.....	1
Conventions Used in This Book	2
Foolish Assumptions	2
How This Book Is Organized.....	3
Part I: Homing in on Basic Solutions.....	3
Part II: Facing Off with Functions	4
Part III: Conquering Conics and Systems of Equations	4
Part IV: Shifting into High Gear with Advanced Concepts	5
Part V: The Part of Tens.....	5
Icons Used in This Book.....	5
Where to Go from Here.....	6

***Part I: Homing in on Basic Solutions*..... 7**

Chapter 1: Going Beyond Beginning Algebra 9

Outlining Algebra Properties.....	10
Keeping order with the commutative property	10
Maintaining group harmony with the associative property	10
Distributing a wealth of values	11
Checking out an algebraic ID	12
Singing along in-verses	13
Ordering Your Operations.....	13
Equipping Yourself with the Multiplication Property of Zero	14
Expounding on Exponential Rules	15
Multiplying and dividing exponents	15
Getting to the roots of exponents	15
Raising or lowering the roof with exponents.....	16
Making nice with negative exponents.....	17
Implementing Factoring Techniques	17
Factoring two terms	17
Taking on three terms.....	18
Factoring four or more terms by grouping	22

Chapter 2: Toeing the Straight Line: Linear Equations 23

Linear Equations: Handling the First Degree.....	23
Tackling basic linear equations	24
Clearing out fractions	25
Isolating different unknowns	26

Linear Inequalities: Algebraic Relationship Therapy	28
Solving basic inequalities	28
Introducing interval notation.....	29
Compounding inequality issues	30
Absolute Value: Keeping Everything in Line.....	32
Solving absolute-value equations.....	32
Seeing through absolute-value inequality	34
Chapter 3: Cracking Quadratic Equations	37
Solving Simple Quadratics with the Square Root Rule.....	38
Finding simple square-root solutions	38
Dealing with radical square-root solutions	38
Dismantling Quadratic Equations into Factors	39
Factoring binomials	39
Factoring trinomials.....	41
Factoring by grouping.....	42
Resorting to the Quadratic Formula.....	43
Finding rational solutions	44
Straightening out irrational solutions.....	44
Formulating huge quadratic results.....	45
Completing the Square: Warming Up for Conics	46
Squaring up to solve a quadratic equation	46
Completing the square twice over	48
Getting Promoted to High-Powered Quadratics (without the Raise).....	49
Handling the sum or difference of cubes	50
Tackling quadratic-like trinomials.....	51
Solving Quadratic Inequalities	52
Keeping it strictly quadratic	53
Signing up for fractions	54
Increasing the number of factors	55
Chapter 4: Rooting Out the Rational, Radical, and Negative	57
Acting Rationally with Fraction-Filled Equations	57
Solving rational equations by tuning in your LCD	58
Solving rational equations with proportions.....	62
Ridding Yourself of a Radical.....	65
Squaring both sides of a radical equation	65
Calming two radicals.....	67
Changing Negative Attitudes about Exponents.....	68
Flipping negative exponents out of the picture.....	69
Factoring out negatives to solve equations	70
Fooling Around with Fractional Exponents	73
Combining terms with fractional exponents	73
Factoring fractional exponents.....	73
Solving equations by working with fractional exponents	74

Chapter 5: Graphing Your Way to the Good Life	77
Coordinating Your Graphing Efforts	78
Identifying the parts of the coordinate plane	78
Plotting from dot to dot	79
Streamlining the Graphing Process with Intercepts and Symmetry	80
Finding x- and y-intercepts	80
Reflecting on a graph's symmetry	82
Graphing Lines	84
Finding the slope of a line	85
Facing two types of equations for lines	86
Identifying parallel and perpendicular lines	88
Looking at 10 Basic Forms	89
Lines and quadratics	90
Cubics and quartics	90
Radicals and rationals	91
Exponential and logarithmic curves	92
Absolute values and circles	93
Solving Problems with a Graphing Calculator	93
Entering equations into graphing calculators correctly	94
Looking through the graphing window	96

Part II: Facing Off with Functions **97**

Chapter 6: Formulating Function Facts	99
Defining Functions	99
Introducing function notation	100
Evaluating functions	100
Homing In on Domain and Range	101
Determining a function's domain	101
Describing a function's range	102
Betting on Even or Odd Functions	104
Recognizing even and odd functions	104
Applying even and odd functions to graphs	105
Facing One-to-One Confrontations	106
Defining one-to-one functions	106
Eliminating one-to-one violators	107
Going to Pieces with Piecewise Functions	108
Doing piecework	108
Applying piecewise functions	110
Composing Yourself and Functions	111
Performing compositions	112
Simplifying the difference quotient	113
Singing Along with Inverse Functions	114
Determining if functions are inverses	114
Solving for the inverse of a function	115



Chapter 7: Sketching and Interpreting Quadratic Functions117

Interpreting the Standard Form of Quadratics.....	117
Starting with “a” in the standard form.....	118
Following up with “b” and “c”.....	119
Investigating Intercepts in Quadratics.....	120
Finding the one and only y-intercept.....	120
Finding the x-intercepts.....	122
Going to the Extreme: Finding the Vertex.....	124
Lining Up along the Axis of Symmetry.....	126
Sketching a Graph from the Available Information.....	127
Applying Quadratics to the Real World.....	129
Selling candles.....	129
Shooting basketballs.....	130
Launching a water balloon.....	131

Chapter 8: Staying Ahead of the Curves: Polynomials133

Taking a Look at the Standard Polynomial Form.....	133
Exploring Polynomial Intercepts and Turning Points.....	134
Interpreting relative value and absolute value.....	135
Counting intercepts and turning points.....	136
Solving for polynomial intercepts.....	137
Determining Positive and Negative Intervals.....	139
Using a sign-line.....	139
Interpreting the rule.....	141
Finding the Roots of a Polynomial.....	142
Factoring for polynomial roots.....	143
Saving your sanity: The Rational Root Theorem.....	145
Letting Descartes make a ruling on signs.....	148
Synthesizing Root Findings.....	149
Using synthetic division to test for roots.....	150
Synthetically dividing by a binomial.....	153
Wringing out the Remainder (Theorem).....	154

Chapter 9: Relying on Reason: Rational Functions157

Exploring Rational Functions.....	158
Sizing up domain.....	158
Introducing intercepts.....	159
Adding Asymptotes to the Rational Pot.....	159
Determining the equations of vertical asymptotes.....	160
Determining the equations of horizontal asymptotes.....	160
Graphing vertical and horizontal asymptotes.....	161
Crunching the numbers and graphing oblique asymptotes.....	162
Accounting for Removable Discontinuities.....	164
Removal by factoring.....	164
Evaluating the removal restrictions.....	165
Showing removable discontinuities on a graph.....	165

Pushing the Limits of Rational Functions166
 Evaluating limits at discontinuities.....168
 Going to infinity170
 Catching rational limits at infinity.....172
 Putting It All Together: Sketching Rational Graphs from Clues173

Chapter 10: Exposing Exponential and Logarithmic Functions177

Evaluating Exponential Expressions.....177
 Exponential Functions: It’s All About the Base, Baby178
 Observing the trends in bases.....179
 Meeting the most frequently used bases: 10 and e.....180
 Solving Exponential Equations.....182
 Making bases match.....182
 Recognizing and using quadratic patterns184
 Showing an “Interest” in Exponential Functions185
 Applying the compound interest formula.....185
 Looking at continuous compounding.....188
 Logging On to Logarithmic Functions189
 Meeting the properties of logarithms.....189
 Putting your logs to work.....190
 Solving Logarithmic Equations.....193
 Setting log equal to log193
 Rewriting log equations as exponentials.....195
 Graphing Exponential and Logarithmic Functions196
 Expounding on the exponential.....196
 Not seeing the logs for the trees198

Part III: Conquering Conics and Systems of Equations ...201

Chapter 11: Cutting Up Conic Sections203

Cutting Up a Cone203
 Opening Every Which Way with Parabolas204
 Looking at parabolas with vertices at the origin205
 Observing the general form of parabola equations208
 Sketching the graphs of parabolas.....209
 Converting parabolic equations to the standard form.....212
 Going Round and Round in Conic Circles213
 Standardizing the circle.....213
 Specializing in circles.....214
 Preparing Your Eyes for Solar Ellipses215
 Raising the standards of an ellipse216
 Sketching an elliptical path.....218
 Feeling Hyper about Hyperbolas.....219
 Including the asymptotes220
 Graphing hyperbolas222
 Identifying Conics from Their Equations, Standard or Not223

Chapter 12: Solving Systems of Linear Equations 225

Looking at the Standard Linear-Systems Form and Its Possible Solutions	225
Graphing Solutions of Linear Systems.....	226
Pinpointing the intersection	227
Toeing the same line twice.....	228
Dealing with parallel lines	228
Eliminating Systems of Two Linear Equations with Addition	229
Getting to an elimination point.....	230
Recognizing solutions for parallel and coexisting lines	231
Solving Systems of Two Linear Equations with Substitution	232
Variable substituting made easy	232
Identifying parallel and coexisting lines	233
Using Cramer's Rule to Defeat Unwieldy Fractions	234
Setting up the linear system for Cramer	235
Applying Cramer's Rule to a linear system	236
Raising Linear Systems to Three Linear Equations	237
Solving three-equation systems with algebra.....	237
Settling for a generalized solution for linear combinations.....	239
Upping the Ante with Increased Equations	241
Applying Linear Systems to Our 3-D World	243
Using Systems to Decompose Fractions	244

**Chapter 13: Solving Systems of Nonlinear
Equations and Inequalities 247**

Crossing Parabolas with Lines	247
Determining the point(s) where a line and parabola cross paths	248
Dealing with a solution that's no solution.....	250
Intertwining Parabolas and Circles.....	251
Managing multiple intersections	252
Sorting out the solutions.....	254
Planning Your Attack on Other Systems of Equations	255
Mixing polynomials and lines	256
Crossing polynomials.....	257
Navigating exponential intersections	259
Rounding up rational functions	261
Playing Fair with Inequalities	264
Drawing and quartering inequalities	264
Graphing areas with curves and lines	265

***Part IV: Shifting into High Gear
with Advanced Concepts*267**

Chapter 14: Simplifying Complex Numbers in a Complex World269

Using Your Imagination to Simplify Powers of i	270
Understanding the Complexity of Complex Numbers.....	271
Operating on complex numbers.....	272
Multiplying by the conjugate to perform division	273
Simplifying radicals.....	275
Solving Quadratic Equations with Complex Solutions.....	276
Working Polynomials with Complex Solutions.....	278
Identifying conjugate pairs.....	278
Interpreting complex zeros	279

Chapter 15: Making Moves with Matrices281

Describing the Different Types of Matrices	282
Row and column matrices.....	282
Square matrices.....	283
Zero matrices	283
Identity matrices	284
Performing Operations on Matrices	284
Adding and subtracting matrices.....	285
Multiplying matrices by scalars	286
Multiplying two matrices.....	286
Applying matrices and operations.....	288
Defining Row Operations	292
Finding Inverse Matrices.....	293
Determining additive inverses.....	294
Determining multiplicative inverses.....	294
Dividing Matrices by Using Inverses	299
Using Matrices to Find Solutions for Systems of Equations	300

Chapter 16: Making a List: Sequences and Series303

Understanding Sequence Terminology	303
Using sequence notation.....	304
No-fear factorials in sequences	304
Alternating sequential patterns.....	305
Looking for sequential patterns	306
Taking Note of Arithmetic and Geometric Sequences.....	309
Finding common ground: Arithmetic sequences	309
Taking the multiplicative approach: Geometric sequences.....	311

Recursively Defining Functions	312
Making a Series of Moves	313
Introducing summation notation	314
Summing arithmetically.....	315
Summing geometrically	316
Applying Sums of Sequences to the Real World.....	318
Cleaning up an amphitheater.....	318
Negotiating your allowance	319
Bouncing a ball	320
Highlighting Special Formulas	322
Chapter 17: Everything You Wanted to Know about Sets	323
Revealing Set Notation	323
Listing elements with a roster	324
Building sets from scratch	324
Going for all (universal set) or nothing (empty set).....	325
Subbing in with subsets.....	325
Operating on Sets.....	327
Celebrating the union of two sets	327
Looking both ways for set intersections	328
Feeling complementary about sets	329
Counting the elements in sets	329
Drawing Venn You Feel Like It	330
Applying the Venn diagram	331
Using Venn diagrams with set operations.....	332
Adding a set to a Venn diagram	333
Focusing on Factorials.....	336
Making factorial manageable	336
Simplifying factorials	337
How Do I Love Thee? Let Me Count Up the Ways	338
Applying the multiplication principle to sets	338
Arranging permutations of sets	339
Mixing up sets with combinations	343
Branching Out with Tree Diagrams	344
Picturing a tree diagram for a permutation	345
Drawing a tree diagram for a combination	346
 Part V: The Part of Tens	 347
Chapter 18: Ten Multiplication Tricks	349
Chapter 19: Ten Special Types of Numbers	357
 Index.....	 361