CONTENTS

	Preface v	
1	Sets and Operations 1-1 Sets 1 1-2 Related Sets 2 1-3 Operations on Sets 4	1
2	The Real Numbers 2-1 A Deductive System 8 2-2 Field Axioms of Real Numbers 9 2-3 Immediate Consequences of the Field Axioms 12 2-4 Rational and Irrational Numbers 19 2-5 The Real Number Axis 21	8
3	Operations on Algebraic Expressions 3-1 Some Definitions 26 3-2 Addition and Subtraction 27 3-3 Multiplication 30 3-4 Division 33 3-5 Special products 37	26
4	Factoring and Operations on Fractions 4-1 Simple Types of Factoring 41 4-2 General Second-Degree Trinomial 43 4-3 Factoring by Grouping 44 4-4 Algebraic Fractions 45 4-5 Reduction to Lowest Terms 46 4-6 Multiplication and Division of Fractions 47 4-7 Addition of Fractions 50 4-8 Complex Fractions 52	41
5	Functions and Relations 5-1 Rectangular Coordinates 57 5-2 Relations and Functions 59 5-3 Graphs of Functions and Relations 62 5-4 The Distance Formula and the Circle 66	57

viii

6	Linear Equations	74	
Ŭ		71	
	6-1 Conditional Equations and Identities 71 6-2 Operations on Equations 72		
	6-3 Linear Equations in One Variable 73		
	6-4 Word Problems 75		
	6-5 Linear Equations in Two Variables 79		
	6-6 Solution by Algebraic Methods 82		
	6-7 Linear Equations in Three Unknowns 84		
	6-8 Word Problems Leading to Systems of Equations 87		
	6-9 Ratio and Proportion 89		
	6-10 Variation 92		
7	Exponents and Radicals		
	7-1 Laws of Exponents 98		
	7-2 Zero and Negative Integral Exponents 99		
	7-3 Fractional Exponents 101		
	7-4 Laws of Radicals 103		
	7-5 Addition and Subtraction of Radicals 106		
	7-6 Multiplication and Division of Radicals 107		
	7-7 Complex Numbers 109		
8	Quadratic Equations	115	
	8-1 Solution by Factoring 115		
	8-2 Solutions by Formula 116		
	8-3 Equations in Quadratic Form 120		
	8-4 Equations Containing Radicals 121		
	8-5 Nature of the Roots 123		
	8-6 Sum and Product of the Roots 124		
	8-7 The Graph of a Quadratic Function 126		
	8-8 Maximum and Minimum Values 127		
9	Systems Involving Quadratic Equations	134	
	9-1 The Graph of a Quadratic Equation in x and y 134		
	9-2 Solution of a Quadratic System by Graphing 138		
	9-3 Solution by Algebraic Methods 139		
	9-4 A System with no xy or First-Degree Term 140		
	9-5 A System with a Linear and a Quadratic Equation 141		
	9-6 A System with no First-Degree Terms 142		
10	Inequalities	146	
	10-1 The Order Axioms 146		
	10-2 Solution of Inequalities 149		
	10-3 Absolute Inequalities 151		
	10-4 Systems of Inequalities 152		

CONTENTS

ix

11	Progressions 11-1 Sequences 157	157
	11-2 Arithmetic Progressions 158 11-3 Geometric Progressions 162 11-4 Infinite Geometric Progressions 165 11-5 Harmonic Progressions 167	
12	Permutations, Combinations, and Probability 12-1 Fundamental Principal 169 12-2 Permutations 171 12-3 Permutations of Things Not All Different 173 12-4 Combinations 176 12-5 Probability in Single Events 179 12-6 Probability in Multiple Events 183 12-7 Probabilities in Repeated Trials 186	169
13	The Binomial Theorem and Mathematical Induction 13-1 The Binomial Expansion 188 13-2 The Binomial Series 193 13-3 Mathematical Induction 194 13-4 Proof of the Binomial Theorem by Mathematical Induction 19	188 7
14	Theory of Equations 14-1 Polynomials and Polynomial Equations 200 14-2 The Remainder Theorem and the Factor Theorem 200 14-3 Synthetic Division 202 14-4 Theorems Concerning Roots 205 14-5 Coefficients in Terms of Roots 208 14-6 Rational Roots 210 14-7 The Graph of a Polynomial Function 214 14-8 A Method of Approximating Irrational Roots 215 14-9 Descartes' Rule of Signs 220	200
15	Complex Numbers 15-1 The Field of Complex Numbers 223 15-2 Graphical Representation of Complex Numbers 226 15-3 Trigonometric Form of a Complex Number 229 15-4 Multiplication and Division of Numbers in Polar Form 231 15-5 Powers and Roots of Numbers 234	223
16	Matrices and Determinants 16-1 Matrices and Linear Equations 241 16-2 Determinants of Orders Two and Three 244 16-3 Determinants of Order n 246 16-4 Properties of Determinants 248	241

16-5 Expansion by Cofactors	252 near Equations by Determinants 257	
16-7 Linear Systems with More		
16-8 Systems of Homogenous I		
2	-	
16-10 The Inverse of a Square	Matrix 268	
17 Logarithms	2	74
17-1 The Logarithmic Function	274	
17-2 Properties of Logarithms	276	
4	278	
17-4 The Characteristic and Ma	antissa 279	
	282	
17-6 Interpolation 284		
17-7 Logarithms Used in Comp	outations 287	
17-8 Exponential Equations	289	
17-9 Logarithms of a Number to		
the state of the s	91	
	<i>71</i>	
18 Partial Fractions	2	94
18-1 Resolution of Fractions	294	
18-2 Distinct Linear Factors	295	
18-3 Reapeated Linear Factors	297	
18-4 Distinct Quadratic Factors	s 298	
18-5 Repeated Quadratic Facto	rs 300	
Answers to Odd-Numbered Problems	3	03
Index	3	27
	S	-1