CONTENTS

	PREFACE v	
Chapter 1	NUMBERS 1	
§ 1 2 3 4	Rational numbers 1 Real numbers 3 Inequalities 10 The square root of 2 is irrational	16
Chapter 2	COORDINATES 18	
§ 1 2 3 4 5	Points 18 Lines 23 Circles 31 Conics 35 Geometry and numbers 46	
Chapter 3	FUNCTIONS 49	
§ 1 2 3 4	Functions and graphs 49 Polynomial and rational functions Continuous functions 60 Limits 66	56

Chapter 4	DERIVATIVES 72
§ 1 2 3	Differentiation 84
Chapter 5	APPLICATIONS OF DERIVATIVES 98
§ 1 2 3	The shape of a graph 104
Chapter 6	DERIVATIVES, CONTINUED 122
§ 1 2 3 2 5	Composite functions. Radical functions 129 Implicit differentiation. Algebraic functions 137 Primitive functions or antiderivatives 141
Chapter 7	APPLICATIONS OF DERIVATIVES, CONTINUED 148
§ /	Rate of change 154
Chapter 8	INTEGRALS 165
;	The integral of a function. The area under a curve The fundamental theorem of calculus Integration Improper integrals Proof of the fundamental theorem 201
Chapter 9	APPLICATIONS OF INTEGRALS 203
	1 Area 203 2 Volume 209 3 Length 221 4 Moments 226 5 Energy 231
Chapter 10	TRIGONOMETRIC FUNCTIONS AND THEIR INVERSES 239
	1 Review of basic properties 239 2 Differentiation of trigonometric functions 254 3 Inverse trigonometric functions 263

viii

CONTENTS

		Contents
Chapter 11	LOGARITHMS AND EXPONENTIALS 273	
§ 1 2 3	3	280
Chapter 12	APPLICATIONS OF TRANSCENDENTAL FUNCTIONS	293
§ 1 2 3 4	Exponential growth and decay 293 Harmonic motion 299 The normal distribution 304 Other applications of the exponential function	309
Chapter 13	TECHNIQUES OF INTEGRATION 313	
§ 1 2 3 4 5	Numerical integration 313 Integration by parts 320 Integration of rational functions 328 Rationalizable integrals 337 Evaluation of integrals using a table 348	
Chapter 14	MEAN VALUE THEOREM AND TAYLOR'S FORMULA	351
§ 1 2 3	Mean value theorems 351 Taylor's theorem 358 L'Hospital's rule 377	
Chapter 15	INFINITE SERIES 383	
§ 1 2 3	Infinite sequences 383 Infinite series 393 Power series 408	
Chapter 16	POLAR COORDINATES AND PARAMETRIC REPRESENTATIONS 419	
§ 1 2 3 4	Polar coordinates 419 Parametric representation 431 Conics, continued 440 Change of coordinates 446	
Chapter 17	VECTORS AND CURVES IN THE PLANE 458	
§ 1 2	Algebra of vectors 458 Vector calculus 473	
3	Plane motion 480	
4	Plane motion, continued 486	
5	Planetary motion 493	

İΧ

Chapter 18	VECTORS, CURVES, AND SURFACES IN SPACE 500	
§ 1 2 3 4 5 6	Coordinate systems in space 500 Vectors and curves in space 509 Inner product 516 Planes and lines 573 Quadric surfaces 532 Cross product 542	
Chapter 19	PARTIAL DERIVATIVES 549	
§ 1 2 3 4 5	Functions of several variables 549 Derivatives of functions of several variables 555 Partial derivatives of higher order 576 Maxima and minima for functions of several variables 587 Two theorems on partial derivatives 592	
Chapter 20	MULTIPLE INTEGRALS 594	
§ 1 2 3 4 5	Double integrals as volumes 594 Analytic definition of the double integral 605 Applications of double integrals 609 Triple integrals 622 Mass centers and centroids 632	
Chapter 21	LINE INTEGRALS 640	
§ 1 2 3 4	Line integrals in the plane 640 Green's theorem 648 Line integrals in space 654 Applications of line integrals to mechanics 656	
THEORETICAL	SUPPLEMENT 662	
§ 1 2 3 4 5 6 7	Continuous functions 676 Integrals 683 A calculus approach to trigonometric functions 689 Infinite sequences and series 692	
TABLES	711	
ANSWERS TO ODD-NUMBERED PROBLEMS 733		
INDEX	775	