

Contents

PREFACE	ix
PART I. ORDINARY DIFFERENTIAL EQUATIONS	
Section 1	Classification and Solutions of First-Order Differential Equations 3
1.1	General Remarks 3
1.2	Solution of Elementary First-Order Differential Equations 9
1.3	Integration Factors 11
Section 2	Elementary Higher-Order Differential Equations 14
	Exercises 18
Section 3	Existence Theorems 27
	Exercises 41
Section 4	Singular Solutions 50
	Exercises 53
Section 5	Linear Equations of Arbitrary Order 54
Section 6	Solutions of Linear Equations 61
6.1	Solution of Linear Equations with Constant Coefficients 61

6.2	Operational Calculus and Solutions of Linear Differential Equations	68
	Exercises	76
Section 7	Linear Systems with Constant Coefficients	80
	Exercises	90
Section 8	Infinite Series Solutions	98
	Exercises	124
Section 9	Asymptotic Expansion of Solutions of Linear Differential Equations	132
	Exercises	143
Section 10	Solutions of Differential Equations by Definite Integrals	146
	Exercises	152
Section 11	Boundary Value Problems	154
11.1	Introduction	154
	Exercises	158
11.2	Sturm–Liouville Systems	159
	Exercises	177
Section 12	Green’s Function	184
	Exercises	196
Section 13	Expansion Theorems	199
	Exercises	209
Section 14	Nonlinear Differential Equations	218
14.1	General Remarks	218
14.2	Autonomous Systems	219
	Exercises	230
14.3	Stability of Solutions of Differential Equations	233
	Exercises	247
PART II. PARTIAL DIFFERENTIAL EQUATIONS		
Section 1	Introduction	253
	Exercises	264

Section 2	Elementary Second-Order Partial Differential Equations	268
2.1	Classification of Second-Order Equations Exercises	268 276
2.2	The Cauchy Problem and the Characteristic Surfaces Exercises	280 292
Section 3	Second-Order Hyperbolic Differential Equations Exercises	297 329
Section 4	Second-Order Elliptic Differential Equations Exercises	336 351
Section 5	Second-Order Parabolic Differential Equations Exercises	358 370
Section 6	The Fourier Transform and Its Applications to Partial Differential Equations	374
6.1	Definition and Elementary Properties of the Fourier Transform	374
6.2	Applications of the Fourier Transform to Elementary Differential Equations Exercises	388 394
Section 7	Hilbert Space Approach to Partial Differential Equations Exercises	401 418
Section 8	Distributions and Their Applications to Partial Differential Equations Exercises	422 464
INDEX		473