

Ordinary Differential Equations	p. 1
First-Order Differential Equations	p. 3
Preliminary Concepts	p. 3
Separable Equations	p. 11
Linear Differential Equations	p. 23
Exact Differential Equations	p. 28
Integrating Factors	p. 34
Homogeneous, Bernoulli, and Riccati Equations	p. 40
Applications to Mechanics, Electrical Circuits, and Orthogonal Trajectories	p. 48
Existence and Uniqueness for Solutions of Initial Value Problems	p. 61
Second-Order Differential Equations	p. 65
Preliminary Concepts	p. 65
Theory of Solutions $y'' + p(x)y' + q(x)y = f(x)$	p. 66
Reduction of Order	p. 74
The Constant Coefficient Homogeneous Linear Equation	p. 77
Euler's Equation	p. 82
The Nonhomogeneous Equation $y'' + p(x)y' + q(x)y = f(x)$	p. 86
Application of Second-Order Differential Equations to a Mechanical System	p. 98
The Laplace Transform	p. 113
Definition and Basic Properties	p. 113
Solution of Initial Value Problems Using the Laplace Transform	p. 122
Shifting Theorems and the Heaviside Function	p. 127
Convolution	p. 142
Unit Impulses and the Dirac Delta Function	p. 147
Laplace Transform Solution of Systems	p. 152
Differential Equations with Polynomial Coefficients	p. 157
Series Solutions	p. 163
Power Series Solutions of Initial Value Problems	p. 164
Power Series Solutions Using Recurrence Relations	p. 169
Singular Points and the Method of Frobenius	p. 174
Second Solutions and Logarithm Factors	p. 181
Appendix on Power Series	p. 189
Vectors and Linear Algebra	p. 199
Vectors and Vector Spaces	p. 201
The Algebra and Geometry of Vectors	p. 201
The Dot Product	p. 209
The Cross Product	p. 216
The Vector Space \mathbb{R}^n	p. 222
Linear Independence, Spanning Sets, and Dimension in \mathbb{R}^n	p. 228
Abstract Vector Spaces	p. 235

Matrices and Systems of Linear Equations	p. 241
Matrices	p. 242
Elementary Row Operations and Elementary Matrices	p. 256
The Row Echelon Form of a Matrix	p. 263
The Row and Column Spaces of a Matrix and Rank of a Matrix	p. 271
Solution of Homogeneous Systems of Linear Equations	p. 278
The Solution Space of $AX = 0$	p. 287
Nonhomogeneous Systems of Linear Equations	p. 290
Summary for Linear Systems	p. 301
Matrix Inverses	p. 304
Determinants	p. 311
Permutations	p. 311
Definition of the Determinant	p. 313
Properties of Determinants	p. 315
Evaluation of Determinants by Elementary Row and Column Operations	p. 319
Cofactor Expansions	p. 324
Determinants of Triangular Matrices	p. 328
A Determinant Formula for a Matrix Inverse	p. 329
Cramer's Rule	p. 332
The Matrix Tree Theorem	p. 334
Eigenvalues, Diagonalization, and Special Matrices	p. 337
Eigenvalues and Eigenvectors	p. 337
Diagonalization of Matrices	p. 345
Orthogonal and Symmetric Matrices	p. 354
Quadratic Forms	p. 363
Unitary, Hermitian, and Skew-Hermitian Matrices	p. 368
Systems of Differential Equations and Qualitative Methods	p. 375
Systems of Linear Differential Equations	p. 377
Theory of Systems of Linear First-Order Differential Equations	p. 377
Solution of $X' = AX$ When A Is Constant	p. 389
Solution of $X' = AX + G$	p. 410
Qualitative Methods and Systems of Nonlinear Differential Equations	p. 425
Nonlinear Systems and Existence of Solutions	p. 425
The Phase Plane, Phase Portraits, and Direction Fields	p. 428
Phase Portraits of Linear Systems	p. 435
Critical Points and Stability	p. 446
Almost Linear Systems	p. 453
Predator/Prey Population Models	p. 474
Competing Species Models	p. 480
Lyapunov's Stability Criteria	p. 489

Limit Cycles and Periodic Solutions	p. 498
Vector Analysis	p. 509
Vector Differential Calculus	p. 511
Vector Functions of One Variable	p. 511
Velocity, Acceleration, Curvature, and Torsion	p. 517
Vector Fields and Streamlines	p. 528
The Gradient Field and Directional Derivatives	p. 535
Divergence and Curl	p. 547
Vector Integral Calculus	p. 553
Line Integrals	p. 553
Green's Theorem	p. 565
Independence of Path and Potential Theory in the Plane	p. 572
Surfaces in 3-Space and Surface Integrals	p. 583
Applications of Surface Integrals	p. 596
Preparation for the Integral Theorems of Gauss and Stokes	p. 602
The Divergence Theorem of Gauss	p. 604
The Integral Theorem of Stokes	p. 613
Fourier Analysis, Orthogonal Expansions, and Wavelets	p. 623
Fourier Series	p. 625
Why Fourier Series?	p. 625
The Fourier Series of a Function	p. 628
Convergence of Fourier Series	p. 635
Fourier Cosine and Sine Series	p. 651
Integration and Differentiation of Fourier Series	p. 657
The Phase Angle Form of a Fourier Series	p. 667
Complex Fourier Series and the Frequency Spectrum	p. 673
The Fourier Integral and Fourier Transforms	p. 681
The Fourier Integral	p. 681
Fourier Cosine and Sine Integrals	p. 685
The Complex Fourier Integral and the Fourier Transform	p. 687
Additional Properties and Applications of the Fourier Transform	p. 698
The Fourier Cosine and Sine Transforms	p. 717
The Finite Fourier Cosine and Sine Transforms	p. 719
The Discrete Fourier Transform	p. 726
Sampled Fourier Series	p. 733
The Fast Fourier Transform	p. 745
Special Functions, Orthogonal Expansions, and Wavelets	p. 765
Legendre Polynomials	p. 765
Bessel Functions	p. 783
Sturm-Liouville Theory and Eigenfunction Expansions	p. 815

Orthogonal Polynomials	p. 836
Wavelets	p. 841
Partial Differential Equations	p. 855
The Wave Equation	p. 857
The Wave Equation and Initial and Boundary Conditions	p. 857
Fourier Series Solutions of the Wave Equation	p. 862
Wave Motion Along Infinite and Semi-infinite Strings	p. 881
Characteristics and d'Alembert's Solution	p. 895
Normal Modes of Vibration of a Circular Elastic Membrane	p. 904
Vibrations of a Circular Elastic Membrane, Revisited	p. 907
Vibrations of a Rectangular Membrane	p. 910
The Heat Equation	p. 915
The Heat Equation and Initial and Boundary Conditions	p. 915
Fourier Series Solutions of the Heat Equation	p. 918
Heat Conduction in Infinite Media	p. 940
Heat Conduction in an Infinite Cylinder	p. 949
Heat Conduction in a Rectangular Plate	p. 953
The Potential Equation	p. 955
Harmonic Functions and the Dirichlet Problem	p. 955
Dirichlet Problem for a Rectangle	p. 957
Dirichlet Problem for a Disk	p. 959
Poisson's Integral Formula for the Disk	p. 962
Dirichlet Problems in Unbounded Regions	p. 964
A Dirichlet Problem for a Cube	p. 972
The Steady-State Heat Equation for a Solid Sphere	p. 974
The Neumann Problem	p. 978
Canonical Forms, Existence and Uniqueness of Solutions, and Well-Posed Problems	p. 987
Canonical Forms	p. 987
Existence and Uniqueness of Solutions	p. 996
Well-Posed Problems	p. 998
Complex Analysis	p. 1001
Geometry and Arithmetic of Complex Numbers	p. 1003
Complex Numbers	p. 1003
Loci and Sets of Points in the Complex Plane	p. 1012
Complex Functions	p. 1027
Limits, Continuity, and Derivatives	p. 1027
Power Series	p. 1040
The Exponential and Trigonometric Functions	p. 1047
The Complex Logarithm	p. 1056
Powers	p. 1059

Complex Integration	p. 1065
Curves in the Plane	p. 1065
The Integral of a Complex Function	p. 1070
Cauchy's Theorem	p. 1081
Consequences of Cauchy's Theorem	p. 1088
Series Representations of Functions	p. 1101
Power Series Representations	p. 1101
The Laurent Expansion	p. 1113
Singularities and the Residue Theorem	p. 1121
Singularities	p. 1121
The Residue Theorem	p. 1128
Some Applications of the Residue Theorem	p. 1136
Conformal Mappings	p. 1163
Functions as Mappings	p. 1163
Conformal Mappings	p. 1171
Construction of Conformal Mappings Between Domains	p. 1182
Harmonic Functions and the Dirichlet Problem	p. 1193
Complex Function Models of Plane Fluid Flow	p. 1200
Historical Notes	p. 1211
Development of Areas of Mathematics	p. 1213
Ordinary Differential Equations	p. 1213
Matrices and Determinants	p. 1217
Vector Analysis	p. 1218
Fourier Analysis	p. 1220
Partial Differential Equations	p. 1223
Complex Function Theory	p. 1223
Biographical Sketches	p. 1225
Galileo Galilei (1564-1642)	p. 1225
Isaac Newton (1642-1727)	p. 1227
Gottfried Wilhelm Leibniz (1646-1716)	p. 1228
The Bernoulli Family	p. 1229
Leonhard Euler (1707-1783)	p. 1230
Carl Friedrich Gauss (1777-1855)	p. 1230
Joseph-Louis Lagrange (1736-1813)	p. 1231
Pierre-Simon de Laplace (1749-1827)	p. 1232
Augustin-Louis Cauchy (1789-1857)	p. 1233
Joseph Fourier (1768-1830)	p. 1234
Henri Poincare (1854-1912)	p. 1235
Answers and Solutions to Selected Odd-Numbered Problems	p. A1
Index	p. I1

Table of Contents provided by Blackwell's Book Services and R.R. Bowker. Used with permission.