

1. INTRODUCTION TO DIFFERENTIAL EQUATIONS.

Definitions and Terminology. Initial-Value Problems. Differential Equations as Mathematical Models. Chapter 1 in Review.

2. FIRST-ORDER DIFFERENTIAL EQUATIONS.

Solution Curves Without a Solution. Separable Variables. Linear Equations. Exact Equations and Integrating Factors. Solutions by Substitutions. A Numerical Method. Chapter 2 in Review.

3. MODELING WITH FIRST-ORDER DIFFERENTIAL EQUATIONS.

Linear Models. Nonlinear Models. Modeling with Systems of First-Order Differential Equations. Chapter 3 in Review.

4. HIGHER-ORDER DIFFERENTIAL EQUATIONS.

Preliminary Theory-Linear Equations. Reduction of Order. Homogeneous Linear Equations with Constant Coefficients. Undetermined Coefficients-Superposition Approach. Undetermined Coefficients-Annihilator Approach. Variation of Parameters. Cauchy-Euler Equation. Solving Systems of Linear Differential Equations by Elimination. Nonlinear Differential Equations. Chapter 4 in Review.

5. MODELING WITH HIGHER-ORDER DIFFERENTIAL EQUATIONS.

Linear Models: Initial-Value Problems. Linear Models: Boundary-Value Problems. Nonlinear Models. Chapter 5 in Review.

6. SERIES SOLUTIONS OF LINEAR EQUATIONS.

Review of Power Series Solutions About Ordinary Points. Solutions About Singular Points. Special Functions. Chapter 6 in Review.

7. LAPLACE TRANSFORM.

Definition of the Laplace Transform. Inverse Transform and Transforms of Derivatives. Operational Properties I. Operational Properties II. Dirac Delta Function. Systems of Linear Differential Equations. Chapter 7 in Review.

8. SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS.

Preliminary Theory. Homogeneous Linear Systems. Nonhomogeneous Linear Systems. Matrix Exponential. Chapter 8 in Review.

9. NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS.

Euler Methods. Runge-Kutta Methods. Multistep Methods. Higher-Order Equations and Systems. Second-Order Boundary-Value Problems. Chapter 9 in Review.

Appendix I. Gamma Function.

Appendix II. Matrices.

Appendix III. Laplace Transforms.

Answers for Selected Odd-Numbered Problems.