
Topics:

1. First Order Differential Equations (Chapters 1, 2)
   - Introduction; direction fields (1.11.3)
   - Linear equations; method of integrating factors (2.1)
   - Separable equations (2.2)
   - Modelling with first order equations (2.3)
   - Differences between linear and nonlinear equations (2.4)
   - Autonomous equations and population dynamics (2.5)

2. Second Order Linear Equations (Chapter 3, all sections)

3. The Laplace Transform (Chapter 6, 6.1-6.5)

4. Systems of First Order Linear Equations (Chapter 7)
   - Basic theory of systems of first order linear equations (7.4)
   - Homogeneous linear systems with constant coefficients (7.5)
   - Complex eigenvalues (7.6)
   - Fundamental matrices (7.7)
   - Repeated eigenvalues (7.8)
   - Nonhomogeneous linear systems (7.9)

5. Numerical Methods (Chapter 8)
   - The Euler or tangent line method (8.1)
   - Improvements on the Euler method (8.2)
   - The Runge-Kutta method (8.3)
   - Systems of first order equations (8.6)

6. Nonlinear Differential Equations and Stability (Chapter 9)
   - The phase plane: linear systems (9.1)
   - Autonomous systems and stability (9.2)
   - Almost linear systems (9.3)
   - Competing species (9.4)
   - Predator-prey equations (9.5)