Topic Overview and Study Checklist

From Chapter 8 in the hardcover textbook:

- Modeling with Autonomous DEs
  - ✓basic models
    - ✓exponential
    - ✓logistic
    - ✓modified logistic
    - ✓selection
    - ✓disease model

From Chapter 8 in the hardcover textbook:

- Analysis of Autonomous DEs
  - ✓equilibria
  - ✓stability
  - ✓phase-line diagrams

From Chapter 8 in the hardcover textbook:

- Solutions of Differential Equations
  - ✓sketch solutions to IVPs
  - ✓use Euler's Method to generate approximate numerical values of the solution
  - ✓find algebraic solutions of separable DEs

From Chapter 8 in the hardcover textbook:

- Systems of Differential Equations
  - ✓Example: Predator-prey models
  - ✓Other examples:

From Chapter 8 in the hardcover textbook:

- Analysis of Systems of Autonomous DEs
  - ✓phase-plane diagrams
  - ✓nullclines
  - ✓equilibria
  - ✓phase-plane trajectories

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x, y)$
  - ✓ Basics:
    - ✓domain
    - ✓range
    - ✓graphs
    - ✓contour maps

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x,y)$
  - ✓Limits and Continuity
    - ✓define the limit of a function in R^3
    - ✓show that a limit does not exist
    - ✓compute a limit when it does exist
    - ✓use limits and the definition of continuity to determine if a function f(x,y) is continuous or not at a point (a,b)

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x,y)$
  - ✓Partial Derivatives
    - ✓definitions
    - ✓computations
    - ✓estimations
    - ✓interpretations (in applications or geometrically)

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x,y)$
  - ✓Directional Derivatives
    - ✓definition
    - ✓theorem
    - ✓computations
    - ✓interpretations (in applications or geometrically)

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x,y)$
  - ✓Gradient Vectors
    - ✓definition
    - ✓computations
    - ✓properties
    - ✓interpretations (in applications or geometrically)

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x,y)$
  - ✓Tangent Planes
    - ✓formula
    - ✓how it is constructed geometrically
  - ✓Linearizations
    - ✓formula
    - ✓when a linearization is a good approximation

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x,y)$
  - ✓Differentiability
    - ✓in words, what does it mean for a function f(x,y) to be differentiable at a point (a,b)?
    - ✓Theorem
  - ✓Second-Order Partial Derivatives
    - ✓compute
    - ✓interpret

From the Functions of Several Variables Module:

- Calculus on Functions of Two Variables: $z = f(x,y)$
  - ✓Local Extreme Values
    - ✓find critical points by solving a system of equations
    - ✓use the Second Derivatives Test to classify points
    - ✓know how to use alternative arguments to classify points if Second Derivatives Test does not apply

From the Probability and Statistics Module:

- Stochastic Models
  - ✓definition
  - ✓basic examples: flipping a coin, rolling a die
  - ✓population model with immigration
  - ✓other definitions: statistic, random experiment

From the Probability and Statistics Module:

- Basics of Probability Theory
  - ✓definitions
    - ✓sample space
    - ✓event + simple event
    - ✓intersection
    - ✓union
    - ✓compliment
    - ✓mutually exclusive/disjoint sets

From the Probability and Statistics Module:

- Basics of Probability Theory
  - ✓probability
    - ✓definition
    - ✓assigning probabilities to equally likely simple events

From the Probability and Statistics Module:

- Conditional Probability
  - ✓definition
  - ✓law of total probability (tree!)
  - ✓Baye's theorem
  - ✓Applications

From the Probability and Statistics Module:

- Independence
  - ✓Definition
  - ✓Applications

From the Probability and Statistics Module:

- Discrete Random Variables
  - ✓definition
  - ✓examples
  - ✓probability mass function (definition, properties, histograms)
  - ✓cumulative distribution function (definition, properties, graphs)
  - ✓calculating probabilities
  - ✓mean, variance, standard deviation (definitions, properties, calculations)

From the Probability and Statistics Module:

- Special Discrete Distribution
  - Binomial

✓know probability mass function, mean and standard deviation
✓be able to identify when a random variable can be described by this distribution

From the Probability and Statistics Module:

- Continuous Random Variables
  - ✓ definition
  - ✓ examples
  - ✓ probability density function (definition, properties, graph)
  - ✓ cumulative distribution function (definition, properties, graph)
  - ✓ calculating probabilities
  - ✓ mean, variance, standard deviation (definitions, calculations)

From the Probability and Statistics Module:

- Special Continuous Distributions
  - Normal (and Standard Normal)

✓know probability mass function, mean and standard deviation
✓be able to identify when a random variable can be described by this distribution