

Math 302 Vocabulary

Section 1.1

1. Approaches to the study of the solutions of differential equations:
Define **Analytic**, **Qualitative**, and **Numerical**.
2. Define **Mathematical Model**, **First-Order Differential Equation**, and **Equilibrium solution**.
3. Give the DE's representing the Exponential Population Model and Logistic Population Model
For the each of the two models, identify the following: Independent Variable(s), Dependent Variable(s), and Parameter(s).

Section 1.2

1. Define **Solution**, **Separable**, and **Autonomous**.
2. (a) Give 2 examples of separable differentiable equations.
(b) Give an example of a differential equation that is not separable.
(c) Give an example of an autonomous differential equation.
(d) Give an example of a separable differential equation that is not autonomous.

Section 1.3

1. What is a **slope field**?
2. What can you say about the slope field of an autonomous differential equation.

Section 1.4

1. List the steps for **Euler's Method**.
2. What happens to your numerical approximation obtained using Euler's Method if you decrease the step size (Δt)?

Section 1.5

1. Does every initial-value problem have a solution?
2. Can an initial-problem have more than one solution?
3. What does the **Existence Theorem** say (in layman's terms)?
4. What does the **Uniqueness Theorem** say (in layman's terms)?
5. In light of the Existence and Uniqueness Theorem, why are equilibrium solutions important?

Section 1.6

1. For what type of differential equations do we consider **phase lines**?
2. How do you determine the **phase line** of a differential equation?
3. Why is the Existence and Uniqueness Theorem important for interpreting phase lines?
4. Define **source**, **sink**, and **node**.
5. State the **Linearization Theorem**.

Section 1.7

1. Define **bifurcation**.
2. How can we find bifurcations?
3. Does every differential equation have a bifurcation? Why or why not?

Section 1.8

1. Define what it means to say that a first-order differential is **linear**.
2. Define **homogeneous** and **nonhomogeneous**.
3. Give examples of each of the following: a linear differential equation, a nonlinear differential equation, a homogeneous differential equation, and a nonhomogeneous differential equation.
4. What does the **Extended Linearity Principle** assert?

Section 1.9

1. How do you determine the **integrating factor** of a linear differential equation?
2. Describe the steps necessary for solving a linear differential equation using the integrating factor method.