

“Theory of O.D.E”

1. System of Differential Equations

- System of First Order Equations
- Vector-Matrix Notation of Systems
- Existence, Uniqueness, and Continuity
- The Gronwall Inequality

2. Linear Systems, with an introduction to Phase Space Analysis

- Existence and Uniqueness for Linear Systems
- Linear Homogeneous Systems
- Linear Nonhomogeneous Systems
- Linear Systems with Constant Coefficients
- Similarity of Matrices and Jordan Canonical Form
- Asymptotic Behavior of Solutions of Linear Systems with Constant Coefficients
- Autonomous System-Phase Space-Two Dimensional Systems
- Linear Systems with Periodic Coefficients

3. Existence Theory

- Existence in the Scalar Case
- Existence Theory for Systems of First-Order Equations
- Uniqueness of Solutions
- Continuation of Solutions
- Dependence on Initial Conditions and Parameters

4. Stability of Linear and Almost Linear Systems

- Definitions of Stability
- Linear Systems

- Almost Linear Systems
- Conditional Stability
- Asymptotic Equivalence
- Stability of Periodic Solutions

5. Lyapanov's Second Method

- Introductory Remarks
- Lyapanov's Theorems
- Proofs of Lyapanov's Theorems

Books:

1. Qualitative Theory of O.D.E ,by Brauer and Nohel
2. Differential Equations: Introduction and Qualitative Theory, by Jane Cronin