

# Contents

<b>Introduction</b>	<b>1</b>
<b>1. Some Elementary Methods</b>	<b>5</b>
The Linear Equation of the First Order   The Equation with Separable Variables   Exact Differential Equations   The Uniqueness Problem: An Example   Some Integral Inequalities   Problems	
<b>2. Existence Theory for Differential Equations</b>	<b>19</b>
The First-Order Equation   First-Order Differential Systems   Equations and Systems of Higher Order   Peano Existence Theorem   A Uniqueness Theorem   Problems	
<b>3. Some Global Problems for Ordinary Differential Equations</b>	<b>39</b>
Statement of the Problems   Global Uniqueness   Global Existence and the Behavior of Saturated Solutions   Dependence of Solutions on Initial Values   Differential Inequalities and the Comparison Method   A Criterion of Global Existence   Problems	

<b>4. Some Special Classes of Differential Systems and Equations</b>	<b>57</b>
Linear Systems: Generalities   Linear Homogeneous Systems   Nonhomogeneous Systems   Linear Equations of Higher Order   Autonomous Systems   Linear Systems and Equations with Constant Coefficients   Problems	
<b>5. Stability Theory of Ordinary Differential Systems</b>	<b>85</b>
Definitions and Examples   Stability of Linear Systems   Stability in the First Approximation   Stability Theorems by Comparison Method   Further Stability Results   Stability of Automatic Control Systems   Problems	
<b>6. Volterra Integral Equations</b>	<b>119</b>
Existence and Uniqueness of Solution   An Existence Theorem   The Linear Equation   The First-Kind Linear Equation   Some Problems on the Half-Axis   Problems	
<b>7. Fredholm Theory of Linear Integral Equations</b>	<b>133</b>
The Resolvent Kernel   The Entire Functions of Fredholm and Their Applications   A Glimpse of Hilbert Space Theory   Eigenvalues, Eigenfunctions and Adjoint Equations   Problems	
<b>8. Theory of Self-Adjoint Integral Equations and Some Applications</b>	<b>155</b>
Some Properties of an Integral Operator   The Existence of Eigenvalues   The Hilbert–Schmidt Expansion Theorem   Complete Kernels and Systems   The Sturm–Liouville Problem   Reduction to an Integral Equation: The First Case   Reduction to an Integral Equation: The Second Case   Problems	
<b>9. Miscellanea (Nice Things)</b>	<b>173</b>
Maximum and Minimum Solutions of Scalar Differential Equations   A Theorem of Massera   An Oscillation Theorem   A Formula of Picone and Its Consequences   Liénard’s Equation   Differential Systems Without Uniqueness   Abel’s Integral Equation	
<b>References</b>	<b>195</b>
<b>Index</b>	<b>203</b>