

A STABLE METHOD FOR SOLVING NONLINEAR VOLTERRA INTEGRAL EQUATIONS WITH TWO CONSTANT DELAYS

R. KATANI⁽¹⁾ AND S. SHAHMORAD⁽²⁾

ABSTRACT. The main purpose of this paper is to propose a block by block method for a class of the Volterra integral equations (VIEs) with double constant delays. The convergence analysis is established and the fifth order of convergence is obtained. Then the stability analysis of the presented method is carried out with respect to the basic test equation

$$y'(t) = 1 + \lambda \int_{t-\tau_2}^{t-\tau_1} y(x)dx, \quad t > 0.$$

The analytical behavior of the solution of test equation is investigated and the properties of the numerical solution are derived. Numerical examples are presented to illustrate the capability and efficiency of the proposed method.

1. INTRODUCTION

Consider the Volterra integral equation

$$(1.1) \quad y(t) = g(t) + \int_{t-\tau_2}^{t-\tau_1} k(t, x, y(x))dx, \quad t \in [0, T] =: I,$$

with the constant delays τ_1, τ_2 ($\tau_2 > \tau_1 > 0$) and $y(t) = \phi(t)$, $t \in [-\tau_2, 0]$, where $\phi(t)$ is a given function such that

$$(1.2) \quad \phi(0) = g(0) + \int_{-\tau_2}^{-\tau_1} k(0, x, \phi(x))dx.$$

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Table of Contents A Method For Solving Nonlinear Volterra Integral Equations

1. Understanding the eBook A Method For Solving Nonlinear Volterra Integral Equations
 - The Rise of Digital Reading A Method For Solving Nonlinear Volterra Integral Equations
 - Advantages of eBooks Over Traditional Books
2. Identifying A Method For Solving Nonlinear Volterra Integral Equations
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an A Method For Solving Nonlinear Volterra Integral Equations
 - User-Friendly Interface
4. Exploring eBook Recommendations from A Method For Solving Nonlinear Volterra Integral Equations
 - Personalized Recommendations
 - A Method For Solving Nonlinear Volterra Integral Equations User Reviews and Ratings
 - A Method For Solving Nonlinear Volterra Integral Equations and Bestseller Lists
5. Accessing A Method For Solving Nonlinear Volterra Integral Equations Free and Paid eBooks
 - A Method For Solving Nonlinear Volterra Integral Equations Public Domain eBooks
 - A Method For Solving Nonlinear Volterra Integral Equations eBook Subscription Services
 - A Method For Solving Nonlinear Volterra Integral Equations Budget-Friendly Options

6. Navigating A Method For Solving Nonlinear Volterra Integral Equations eBook Formats
 - ePub, PDF, MOBI, and More
 - A Method For Solving Nonlinear Volterra Integral Equations Compatibility with Devices
 - A Method For Solving Nonlinear Volterra Integral Equations Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of A Method For Solving Nonlinear Volterra Integral Equations
 - Highlighting and Note-Taking A Method For Solving Nonlinear Volterra Integral Equations
 - Interactive Elements A Method For Solving Nonlinear Volterra Integral Equations
8. Staying Engaged with A Method For Solving Nonlinear Volterra Integral Equations
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers A Method For Solving Nonlinear Volterra Integral Equations
9. Balancing eBooks and Physical Books A Method For Solving Nonlinear Volterra Integral Equations
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection A Method For Solving Nonlinear Volterra Integral Equations
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine A Method For Solving Nonlinear Volterra Integral Equations
 - Setting Reading Goals A Method For Solving Nonlinear Volterra Integral Equations
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of A Method For Solving Nonlinear Volterra Integral Equations
 - Fact-Checking eBook Content of A Method For Solving Nonlinear Volterra Integral Equations
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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