

EIGENVALUES OF BOUNDARY VALUE PROBLEMS FOR HIGHER ORDER DIFFERENTIAL EQUATIONS

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We shall consider the boundary value problem

$$\begin{aligned}y^{(n)} + \lambda Q(t, y, y', \dots, y^{(n-2)}) &= \lambda P(t, y, y', \dots, y^{(n-1)}), \quad n \geq 2, \quad t \in (0, 1), \\y^{(i)}(0) &= 0, \quad 0 \leq i \leq n-3, \\ \alpha y^{(n-2)}(0) - \beta y^{(n-1)}(0) &= 0, \\ \gamma y^{(n-2)}(1) + \delta y^{(n-1)}(1) &= 0,\end{aligned}$$

where $\lambda > 0$, α , β , γ and δ are constants satisfying $\alpha\gamma + \alpha\delta + \beta\gamma > 0$, $\beta, \delta \geq 0$, $\beta + \alpha > 0$ and $\delta + \gamma > 0$ to characterize the values of λ so that it has a positive solution. For the special case $\lambda = 1$, sufficient conditions are also established for the existence of positive solutions.

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1. INTRODUCTION

In this paper we shall consider the n th order differential equation

$$y^{(n)} + \lambda Q(t, y, y', \dots, y^{(n-2)}) = \lambda P(t, y, y', \dots, y^{(n-1)}), \quad t \in (0, 1), \quad (1.1)$$

together with the boundary conditions

$$y^{(i)}(0) = 0, \quad 0 \leq i \leq n-3, \quad (1.2)$$

$$\alpha y^{(n-2)}(0) - \beta y^{(n-1)}(0) = 0, \quad (1.3)$$

$$\gamma y^{(n-2)}(1) + \delta y^{(n-1)}(1) = 0, \quad (1.4)$$

where $n \geq 2$, $\lambda > 0$, α , β , γ and δ are constants so that

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Table of Contents Boundary Value Problems From Higher Order Differential Equations

1. Understanding the eBook Boundary Value Problems From Higher Order Differential Equations
 - The Rise of Digital Reading Boundary Value Problems From Higher Order Differential Equations
 - Advantages of eBooks Over Traditional Books
2. Identifying Boundary Value Problems From Higher Order Differential 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 Boundary Value Problems From Higher Order Differential Equations
 - User-Friendly Interface
4. Exploring eBook Recommendations from Boundary Value Problems From Higher Order Differential Equations

- Personalized Recommendations
 - Boundary Value Problems From Higher Order Differential Equations User Reviews and Ratings
 - Boundary Value Problems From Higher Order Differential Equations and Bestseller Lists
5. Accessing Boundary Value Problems From Higher Order Differential Equations Free and Paid eBooks
 - Boundary Value Problems From Higher Order Differential Equations Public Domain eBooks
 - Boundary Value Problems From Higher Order Differential Equations eBook Subscription Services
 - Boundary Value Problems From Higher Order Differential Equations Budget-Friendly Options
 6. Navigating Boundary Value Problems From Higher Order Differential Equations eBook Formats
 - ePub, PDF, MOBI, and More
 - Boundary Value Problems From Higher Order Differential Equations Compatibility with Devices
 - Boundary Value Problems From Higher Order Differential Equations Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Boundary Value Problems From Higher Order Differential Equations
 - Highlighting and Note-Taking Boundary Value Problems From Higher Order Differential Equations
 - Interactive Elements Boundary Value Problems From Higher Order Differential Equations
 8. Staying Engaged with Boundary Value Problems From Higher Order Differential Equations
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Boundary Value Problems From Higher Order Differential Equations
 9. Balancing eBooks and Physical Books Boundary Value Problems From Higher Order Differential Equations
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Boundary Value Problems From Higher Order Differential Equations
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Boundary Value Problems From Higher Order Differential Equations
 - Setting Reading Goals Boundary Value Problems From Higher Order Differential Equations
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Boundary Value Problems From Higher Order Differential Equations

- Fact-Checking eBook Content of Boundary Value Problems From Higher Order Differential 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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