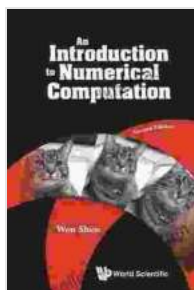


Introduction to Numerical Computation: Journey into the World of Computational Problem-Solving

Are you ready to embark on an exciting journey into the realm of numerical computation? This comprehensive guide is your gateway to understanding the fundamental concepts, techniques, and applications of this powerful tool. Whether you're a beginner eager to explore the field or a seasoned professional seeking to enhance your knowledge, this will provide you with a solid foundation.



Introduction To Numerical Computation, An

by Charles L. Byrne

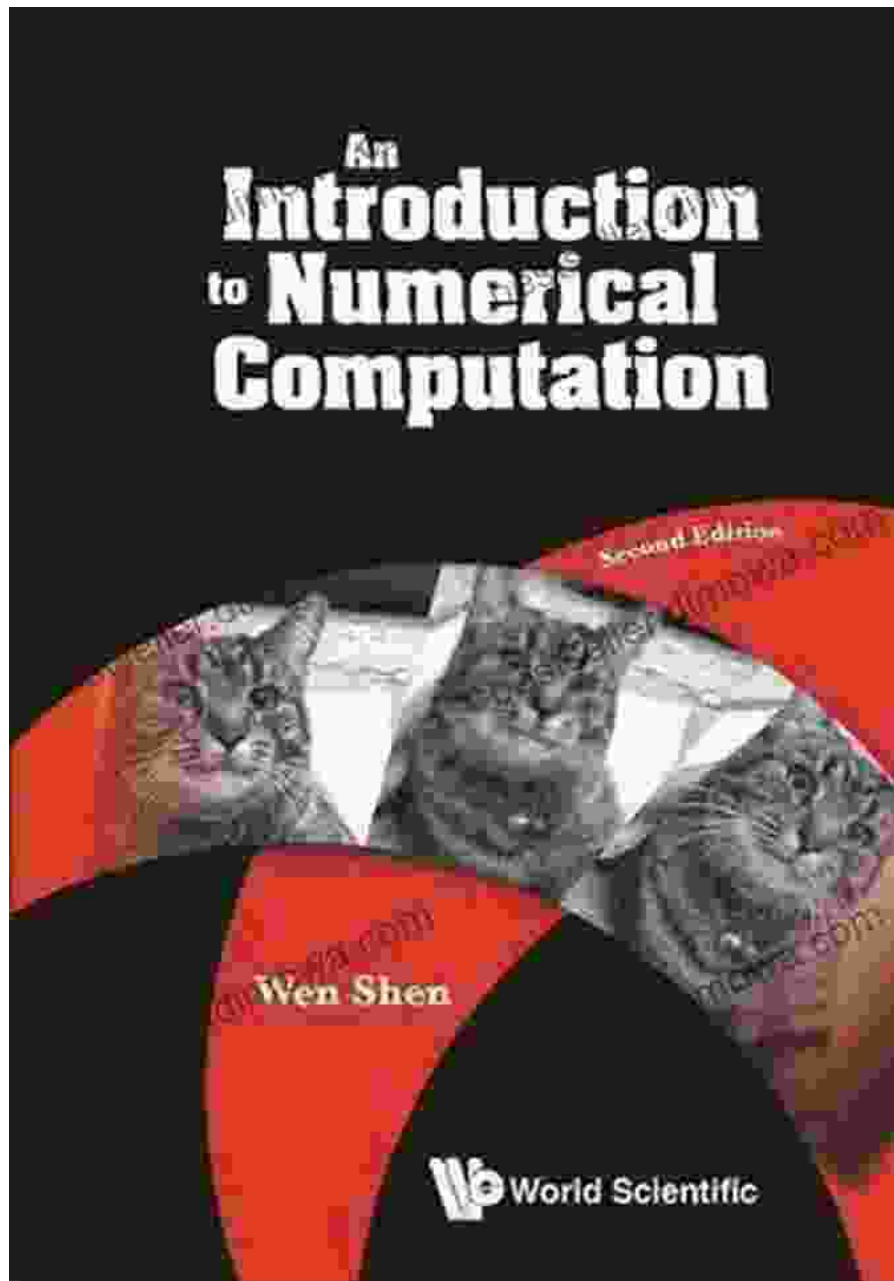
★★★★★ 5 out of 5

Language : English
File size : 19708 KB
Text-to-Speech : Enabled
Enhanced typesetting : Enabled
Print length : 267 pages
Screen Reader : Supported



Chapter 1: The Basics of Numerical Computation

In this opening chapter, we lay the groundwork for understanding numerical computation. We'll delve into the concepts of accuracy, precision, and errors, equipping you with the knowledge to assess the reliability of your computations. Additionally, we'll explore the different types of numerical methods and discuss their strengths and limitations.



Chapter 2: Solving Linear Equations and Systems

Chapter 2 focuses on the techniques used to solve linear equations and systems. We'll cover direct methods like Gaussian elimination and LU decomposition, as well as iterative methods such as Jacobi iteration and Gauss-Seidel iteration. By the end of this chapter, you'll be equipped to tackle a wide range of linear problems.

$$\begin{aligned} 4x + 5y &= 2 && \text{--- Eq. 1} \\ 3x + 4y &= 1.55 && \text{--- Eq. 2} \end{aligned}$$
$$x = 0.25$$
$$4(0.25) + 5y = 2$$
$$\Rightarrow 1 + 5y = 2$$
$$\Rightarrow 5y = 1$$
$$y = \frac{1}{5} = 0.20$$

price of an orange

Chapter 3: Interpolation and Approximation

In Chapter 3, we'll explore the art of interpolating and approximating functions. We'll cover polynomial interpolation, Lagrange interpolation, and spline interpolation techniques, providing you with the tools to estimate values and smooth out data.

Interpolation - Introduction

Estimation of intermediate values between precise data points. The most common method is polynomial interpolation:

$$f(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$$

- Polynomial interpolation is used when the points determined are very precise. The curve representing the behavior has to pass through every point.
- There is **one and only one** ***n***-order polynomial that fits ***n*+1** points

Chapter 4: Numerical Differentiation and Integration

Chapter 4 delves into the numerical techniques used for differentiation and integration. We'll cover finite difference methods, Gaussian quadrature, and Romberg integration, empowering you to compute derivatives and integrals with precision.

- *Calculus* is the mathematics of change. Since engineers continuously deal with systems and processes that change, *calculus* is an essential tool of engineering.
- Standing at the heart of *calculus* are the concepts of:

Differentiation and Integration

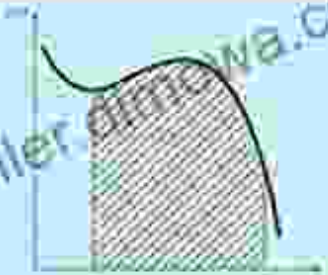
Differentiation


$$\frac{d}{dx} f(x) = f'(x)$$


$$\lim_{\Delta x \rightarrow 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$


and Integration

$$\int f(x) dx$$









Chapter 5: Ordinary Differential Equations

In Chapter 5, we tackle the numerical solution of ordinary differential equations (ODEs). We'll explore explicit and implicit methods, including the Euler method, Runge-Kutta methods, and predictor-corrector methods, enabling you to solve complex ODEs efficiently.

Numerical Solution of Ordinary Differential Equation

- A first order initial value problem of ODE may be written in the form

$$y'(t) = f(y, t), \quad y(0) = y_0$$

- Example:

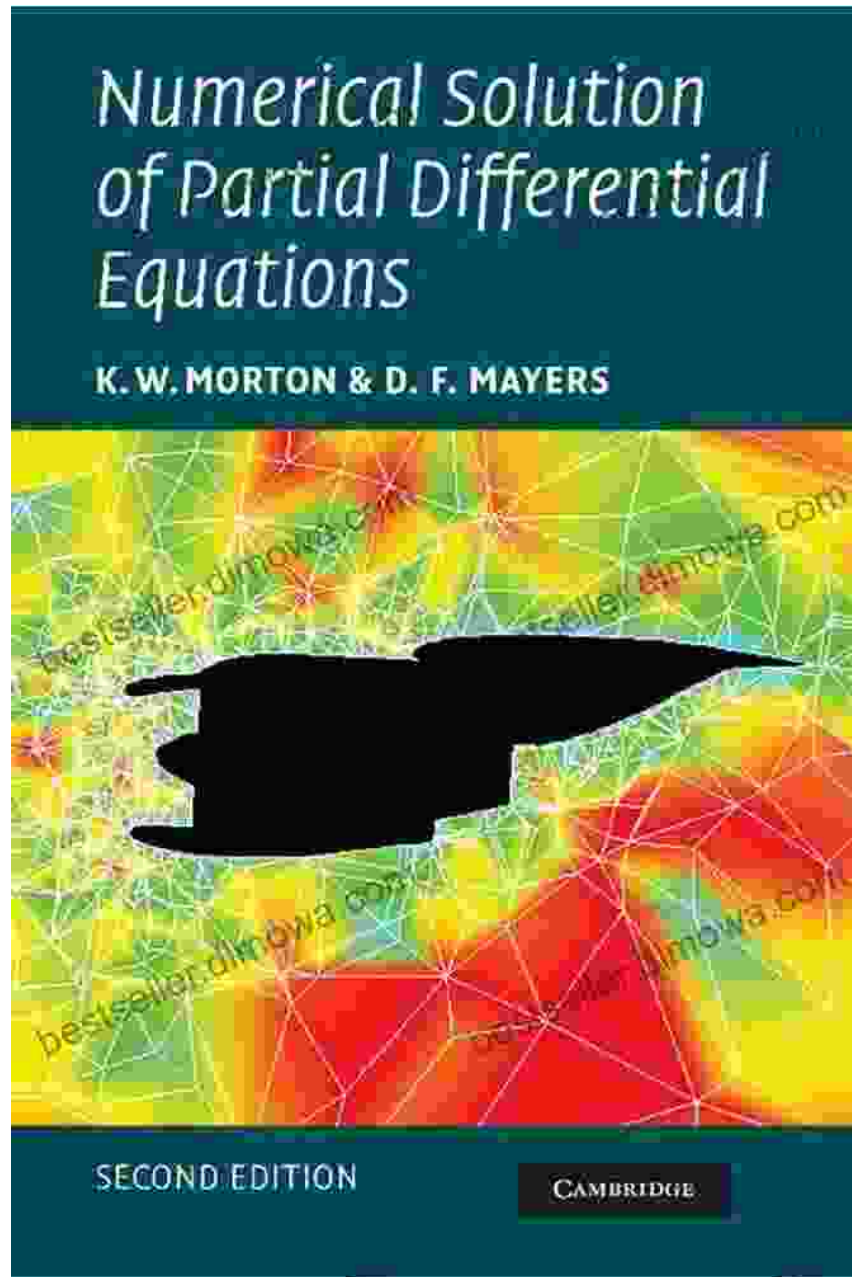
$$y'(t) = 3y + 5, \quad y(0) = 1$$

$$y'(t) = ty + 1, \quad y(0) = 0$$

- Numerical methods for ordinary differential equations calculate solution on the points, $t_n = t_{n-1} + h$ where h is the steps size

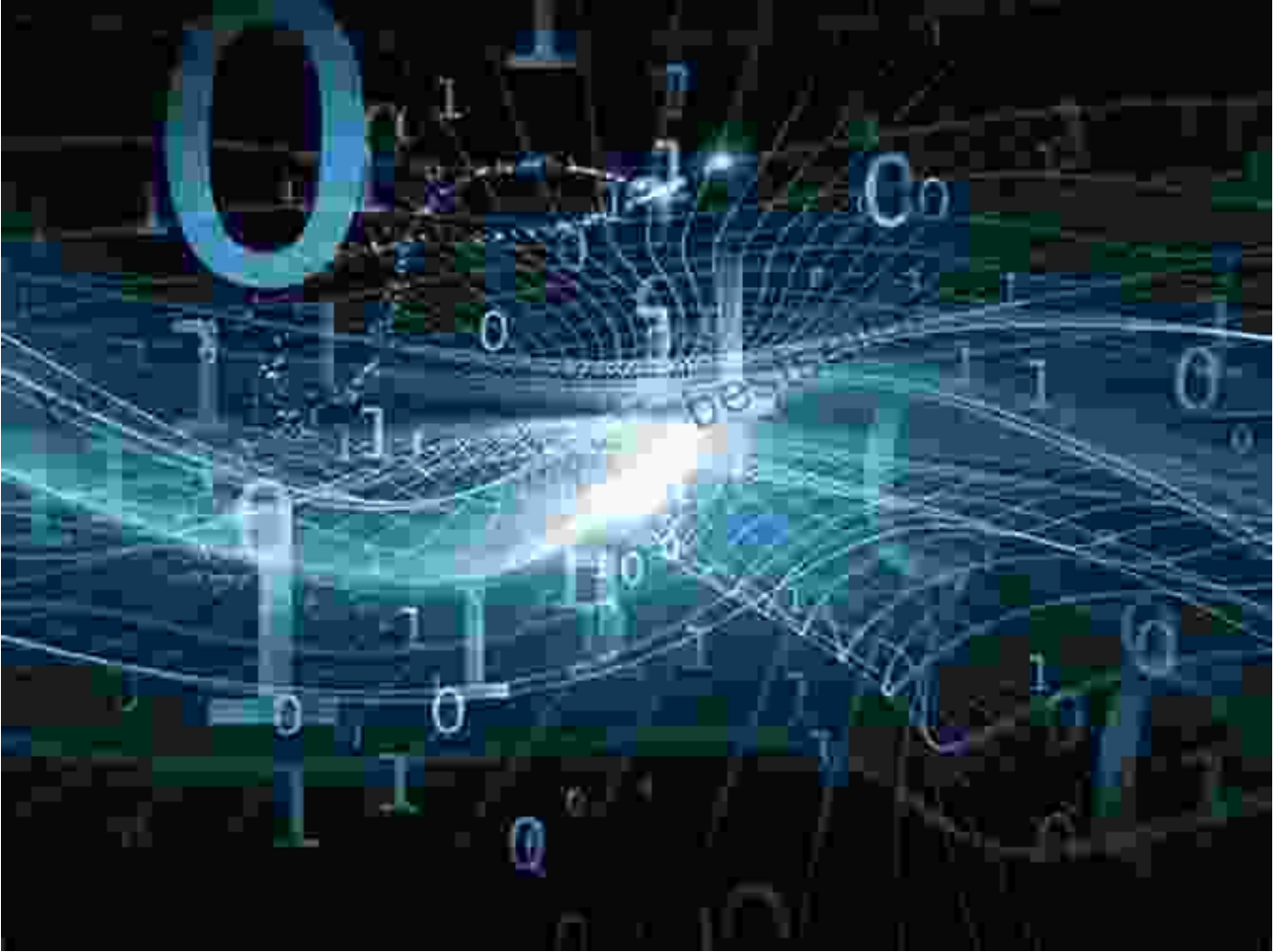
Chapter 6: Partial Differential Equations

Chapter 6 takes on the challenge of solving partial differential equations (PDEs). We'll cover finite difference methods, finite element methods, and spectral methods, providing you with the tools to tackle a wide range of PDE problems.



Chapter 7: Applications of Numerical Computation

The final chapter explores the diverse applications of numerical computation across various fields. We'll delve into examples from engineering, physics, biology, and finance, demonstrating the power of numerical methods in solving real-world problems.



Why Choose This to Numerical Computation?

- **Comprehensive coverage:** Covers the essential concepts, techniques, and applications of numerical computation.
- **Beginner-friendly:** Written in a clear and engaging style, making it accessible to newcomers to the field.
- **Practical examples:** Includes numerous examples and exercises to illustrate the concepts and enhance understanding.
- **Up-to-date content:** Provides the latest advancements and techniques in numerical computation.

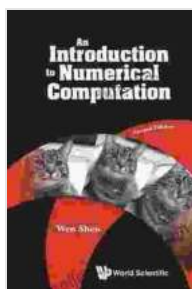
- **Trusted authors:** Written by experienced researchers and educators in the field.

Empower Yourself with Numerical Computation

Unlock the power of numerical computation today! With this comprehensive , you'll gain the knowledge and skills to tackle complex problems, drive innovation, and advance your career. Free Download your copy now and embark on an exciting journey into the world of computational problem-solving.

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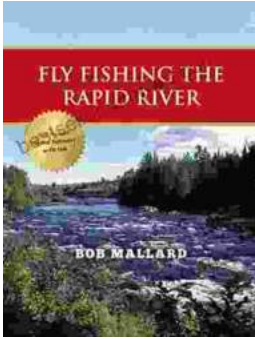
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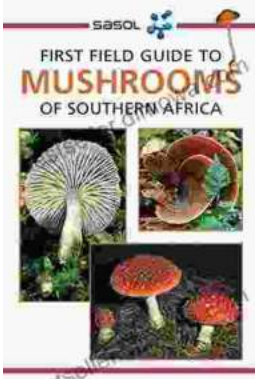
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