

Numerical Calculus: Differentiation and Integration

Numerical calculus is a branch of mathematics that deals with the numerical approximation of derivatives and integrals. It is a powerful tool that can be used to solve a wide variety of problems in mathematics, engineering, and physics.



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by D. James Benton

★★★★☆ 4.6 out of 5

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Differentiation

Differentiation is the process of finding the derivative of a function. The derivative of a function is a measure of how fast the function is changing at a given point.

There are a variety of numerical methods that can be used to approximate the derivative of a function. One common method is the forward difference formula:

$$f'(x) \approx \frac{f(x+h) - f(x)}{h}$$

where h is a small number.

Integration

Integration is the process of finding the integral of a function. The integral of a function is a measure of the area under the curve of the function.

There are a variety of numerical methods that can be used to approximate the integral of a function. One common method is the trapezoidal rule:

$$\int_a^b f(x) dx \approx \frac{h}{2} [f(a) + 2f(a+h) + 2f(a+2h) + \dots + 2f(b-h) + f(b)]$$

where h is the width of the intervals.

Applications of Numerical Calculus

Numerical calculus has a wide variety of applications in mathematics, engineering, and physics. Some of the most common applications include:

- Solving differential equations
- Finding the area under a curve
- Calculating the volume of a solid
- Solving problems in fluid dynamics
- Solving problems in heat transfer

Numerical calculus is a powerful tool that can be used to solve a wide variety of problems in mathematics, engineering, and physics. This

comprehensive guide will provide you with all the essential formulas and techniques you need to get started.



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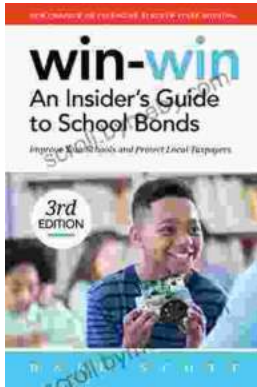
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