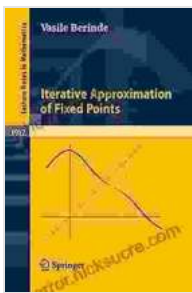


Iterative Approximation of Fixed Points: Lecture Notes in Mathematics 1912

The iterative approximation of fixed points is a powerful technique used in a wide range of applications, including numerical analysis, optimization, and differential equations. This lecture note provides a comprehensive to the theory and practice of iterative approximation methods.



Iterative Approximation of Fixed Points (Lecture Notes in Mathematics Book 1912) by Vasile Berinde

★★★★☆ 4.3 out of 5

Language : English

File size : 5204 KB

Screen Reader : Supported

Print length : 341 pages



Fixed Points and Iterative Methods

A fixed point of a function f is a point x such that $f(x) = x$. Iterative methods for approximating fixed points are based on the idea of repeatedly applying the function to an initial guess until convergence is achieved.

One of the most common iterative methods is the fixed-point iteration method, which is defined by the following equation:

$$x_{n+1} = f(x_n)$$

where x_0 is the initial guess. The fixed-point iteration method converges if the function f satisfies certain conditions, such as being continuous and having a Lipschitz constant less than 1.

Convergence Analysis

The convergence of iterative methods can be analyzed using a variety of techniques. One common approach is to use the Banach fixed-point theorem, which states that a contraction mapping on a complete metric space has a unique fixed point.

Another approach is to use the Cauchy-Schwarz inequality to bound the error between successive iterates. This approach can be used to derive convergence rates for iterative methods.

Applications

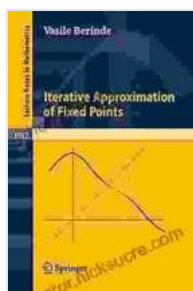
Iterative approximation of fixed points has applications in a wide range of areas, including:

- **Numerical analysis:** Iterative methods are used to solve nonlinear equations and systems of equations.
- **Optimization:** Iterative methods are used to find the minimum or maximum of a function.
- **Differential equations:** Iterative methods are used to solve differential equations by converting them into fixed-point problems.

Iterative approximation of fixed points is a powerful technique with a wide range of applications. This lecture note has provided a comprehensive to the theory and practice of iterative approximation methods.

References

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3. Mitrinović, D. S., & Vasić, P. M. (1970). Analytic inequalities. New York: Springer-Verlag.



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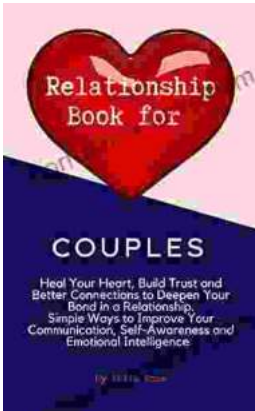
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