The Fascinating Journey of Algebraic Numbers in the First Half of the 20th Century

When we think of numbers, we often associate them with basic arithmetic operations like addition, subtraction, multiplication, and division. However, the realm of numbers goes far beyond these simple operations. Algebraic numbers, a concept that emerged and flourished in the first half of the 20th century, opened up new dimensions in mathematics and transformed our understanding of numbers and their properties.

The Birth of Algebraic Numbers

Algebraic numbers are roots of algebraic equations with integer coefficients. This means that they are solutions to polynomial equations like $x^2 - 2 = 0$ or $x^3 + x - 1 = 0$, where the exponents are non-negative integers and the coefficients are integers. These numbers form an intriguing subset of the complex numbers and have properties that set them apart from rational and irrational numbers.

The Early Pioneers

In the early 20th century, mathematicians like David Hilbert and Richard Dedekind started exploring the properties of algebraic numbers and laid the foundation for their systematic study. Their groundbreaking work led to the development of algebraic number theory, an essential branch of mathematics that continues to evolve to this day.

The Story of Algebraic Numbers in the First Half of the 20th Century: From Hilbert to Tate (Springer
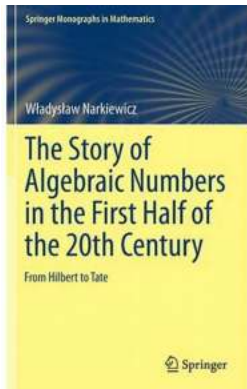
Monographs in Mathematics)

by Władysław Narkiewicz (1st ed. 2018 Edition, Kindle Edition)

★★★★★ 5 out of 5

Language	: English
File size	: 9386 KB
Screen Reader	: Supported
Print length	: 454 pages
X-Ray for textbooks	: Enabled

The Connection to Geometry

One of the most significant breakthroughs in the study of algebraic numbers was the realization of their deep connection to geometry. Mathematicians discovered that there is a profound relationship between algebraic numbers and geometric objects, such as points on a curve or coordinates in higher-dimensional spaces. This connection opened up new avenues for research and led to surprising discoveries and applications.

The Rise of Abstract Algebra

Another pivotal moment in the story of algebraic numbers was the emergence of abstract algebra as a distinct field of study. Algebraic structures like rings, fields, and groups provided a powerful framework for understanding the properties of algebraic numbers and their relationships. This shift towards abstraction allowed mathematicians to generalize their findings and explore a broader range of mathematical concepts.

## The Influence of Number Theory

Number theory, the branch of mathematics dedicated to the study of numbers and their properties, played a vital role in shaping the development of algebraic

numbers. The of new techniques and theorems in number theory brought about significant advancements in our understanding of algebraic numbers and paved the way for further explorations into their intricacies.

Applications in Cryptography

Algebraic numbers found practical applications in cryptography, the science of secure communication. Cryptographic systems rely on the fact that certain mathematical operations, such as factoring large composite numbers into prime factors, are computationally difficult. The properties of algebraic numbers and their relationships with other mathematical structures played a crucial role in designing secure cryptographic algorithms.

The story of algebraic numbers in the first half of the 20th century is a testament to the beauty and versatility of mathematics. From their humble beginnings as solutions to polynomial equations, algebraic numbers grew to become a fundamental building block of abstract algebra and found applications in various fields. Their journey continues to inspire mathematicians who seek to unravel the mysteries of numbers and push the boundaries of human knowledge.
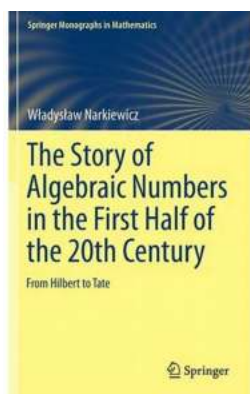
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The book is aimed at people working in number theory or at least interested in this part of mathematics. It presents the development of the theory of algebraic numbers up to the year 1950 and contains a rather complete bibliography of that period. The reader will get information about results obtained before 1950. It is hoped that this may be helpful in preventing rediscoveries of old results, and might also inspire the reader to look at the work done earlier, which may hide some ideas which could be applied in contemporary research.
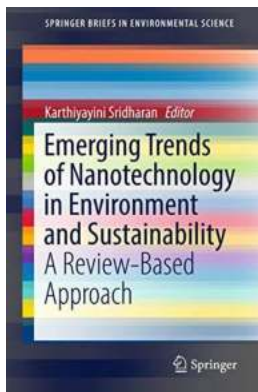
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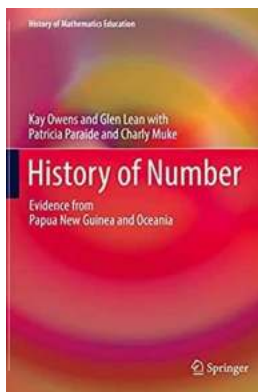
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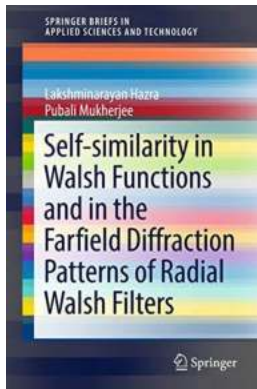
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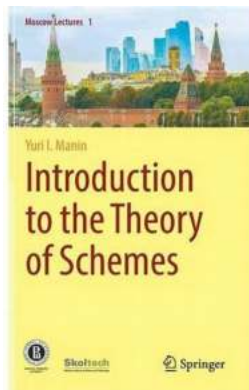
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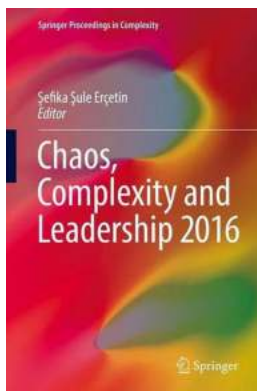
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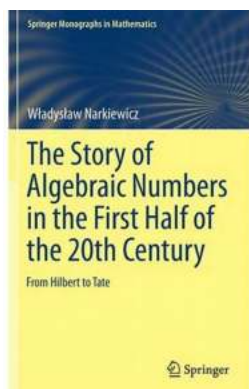
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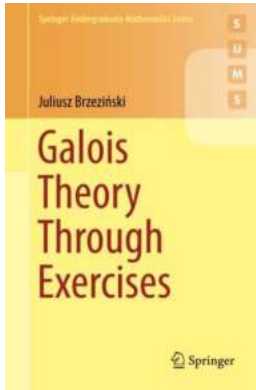
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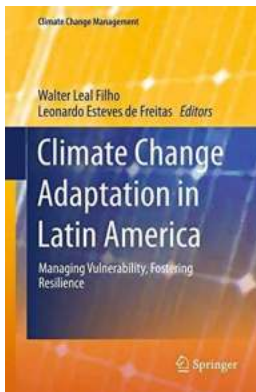
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