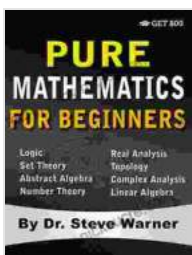


Pure Mathematics for Beginners: Unveiling the Beauty of Numbers and Logic

Welcome to the enigmatic realm of Pure Mathematics, a captivating field where the abstract world of numbers, patterns, and logic intertwine. Unlike Applied Mathematics, which focuses on practical applications in science and engineering, Pure Mathematics delves into the theoretical foundations of mathematics, exploring the intrinsic beauty and elegance of mathematical concepts.

Number Theory: The Essence of Numbers

At the heart of Pure Mathematics lies Number Theory, the study of the properties of numbers. From prime numbers to perfect numbers, Number Theory uncovers the fascinating patterns and relationships embedded within the world of numbers. Prime numbers, for example, are numbers divisible only by themselves and 1, and they play a pivotal role in various areas, including cryptography and computer science.



Pure Mathematics for Beginners: A Rigorous Introduction to Logic, Set Theory, Abstract Algebra, Number Theory, Real Analysis, Topology, Complex Analysis, and Linear Algebra by Steve Warner

★★★★☆ 4.4 out of 5

Language : English

File size : 25807 KB

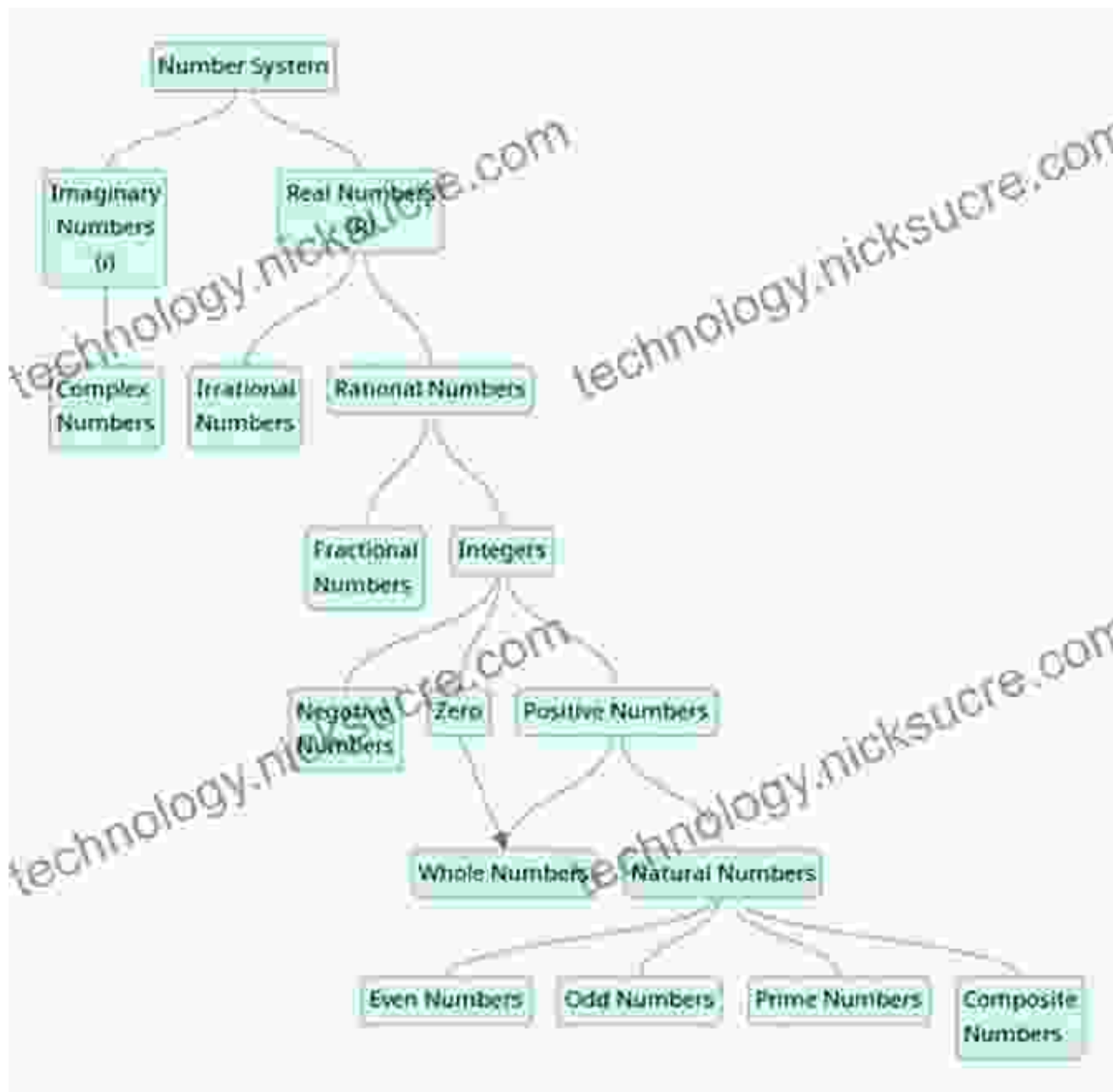
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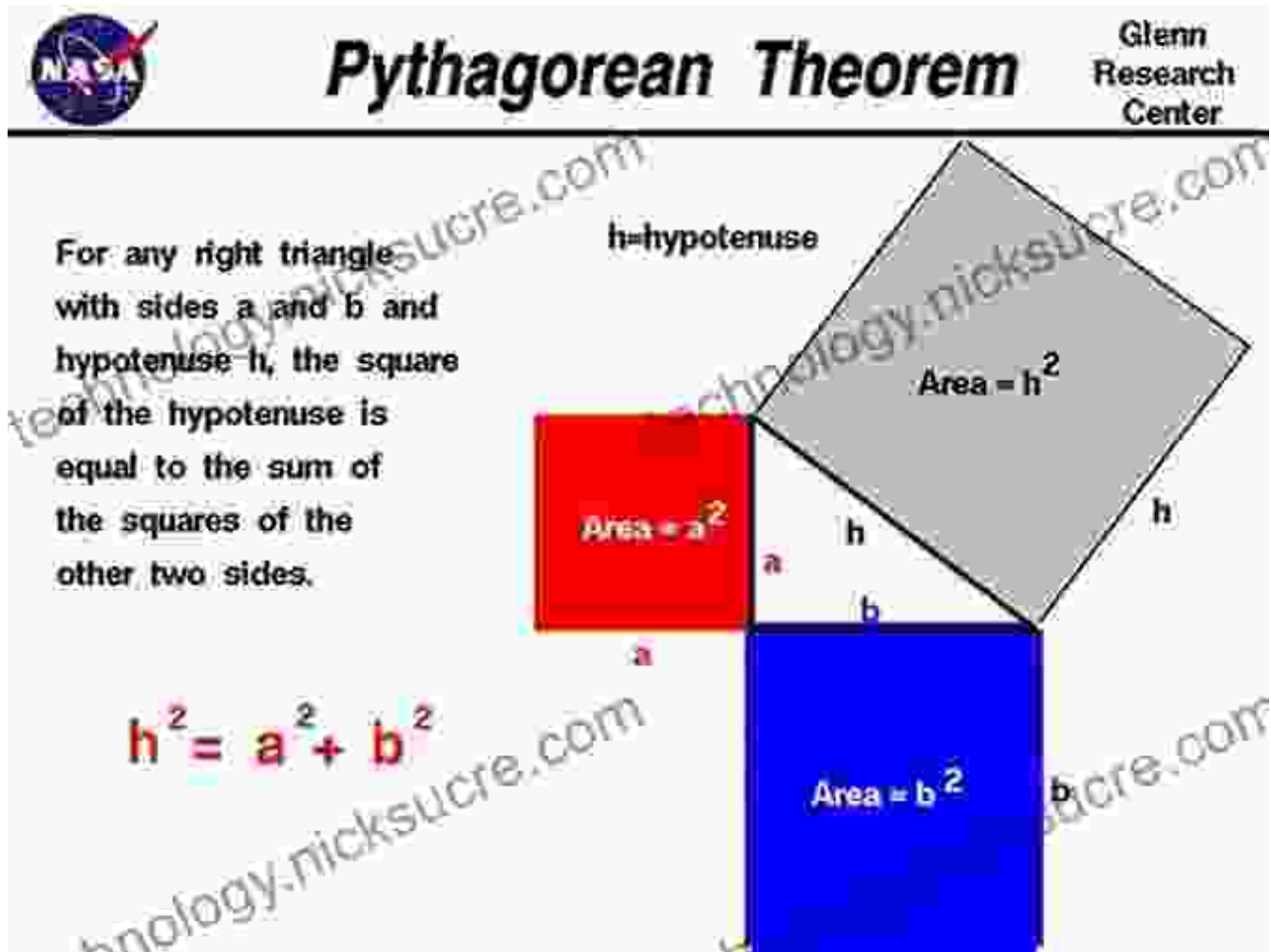
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Algebra: The Power of Symbols

Algebra, another cornerstone of Pure Mathematics, introduces the use of symbols to represent mathematical objects and operations. Through the manipulation of these symbols, Algebra allows us to solve equations, study

polynomials, and unravel complex algebraic structures. Linear Algebra, a vital branch of Algebra, deals with vectors, matrices, and systems of linear equations, finding applications in fields such as computer graphics and machine learning.



Geometry: Unlocking the Shapes of the World

Geometry is the study of shapes and their properties. From the basic principles of Euclidean Geometry to the intricate concepts of Differential Geometry, Geometry explores the relationships between angles, lengths, areas, and volumes. The iconic Pythagorean theorem, for instance, is a fundamental result in Euclidean Geometry that establishes a connection between the sides of a right-angled triangle.

Topology: Unraveling the Secrets of Spaces

Topology, a more advanced branch of Pure Mathematics, investigates the properties of spaces and their continuous transformations. Topologists study the concepts of continuity, connectedness, and compactness, shedding light on the fundamental structure of mathematical spaces. Knot theory, a fascinating area within Topology, explores the properties of knots, providing insights into DNA structures and other complex biological systems.

Calculus: The Calculus of Change

Calculus, the mathematics of change, is a powerful tool for understanding and analyzing the world around us. Through the concepts of differentiation and integration, Calculus provides a framework for modeling and studying continuous change. From calculating the velocity of a moving object to analyzing the growth rate of a population, Calculus finds widespread applications in science, engineering, and economics.

Application of derivatives

Example

$$f(x) = \begin{cases} xe^{ax}; & x \leq 0 \\ x + ax^2 - x^3; & x > 0 \end{cases}$$

Find interval in which $f'(x)$ is increasing

Solution :

$$f'(x) = \begin{cases} xe^{ax}a + e^{ax} & ; x \leq 0 \\ 1 & ; x = 0 \\ 1 + 2ax - 3x^2 & ; x > 0 \end{cases}$$

$$f'(0) = \lim_{h \rightarrow 0} \frac{f(h) - f(0)}{h}$$

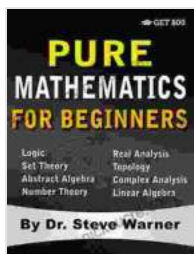
$$= \lim_{h \rightarrow 0} \frac{h + ah^2 - h^3 - 0}{h} = 1$$

Mathematical Reasoning: The Art of Deduction

Mathematical Reasoning is the bedrock of Pure Mathematics. It involves the rigorous application of logical principles to derive new mathematical results. Through deductive reasoning, mathematicians formulate axioms, postulates, and theorems, building a coherent and interconnected system of mathematical knowledge. Set Theory, a fundamental branch of Mathematical Reasoning, provides a framework for understanding the

concept of sets and their properties, laying the foundation for higher-level mathematics.

Pure Mathematics is an intellectually stimulating and rewarding field of study that offers a profound understanding of the world through the lens of numbers, patterns, and logic. From the intricate elegance of Number Theory to the practical applications of Calculus, Pure Mathematics empowers us with a set of tools and concepts that are essential for navigating the complexities of our universe. Whether you are a budding mathematician, a curious learner, or simply someone who appreciates the beauty of abstract thought, Pure Mathematics invites you on an extraordinary journey of intellectual exploration.



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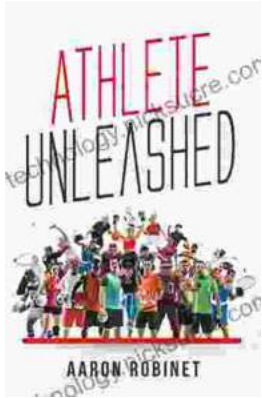
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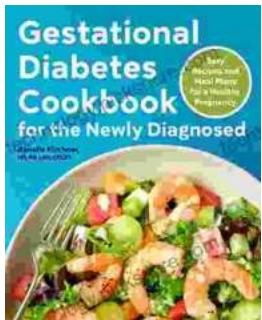
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