

# By William Dunham The Calculus Gallery Masterpieces From Newton To Lebesgue Pdf

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*From Calculus to Chaos* - David Acheson 1997

What is calculus really for? This book is a highly readable introduction to applications of calculus, from Newton's time to the present day. These often involve questions of dynamics, i.e. of how - and why - things change with time. Problems of this kind lie at the heart of much of applied mathematics, physics, and engineering. *From Calculus to Chaos* takes a fresh approach to the subject as a whole, by moving from first steps to the frontiers, and by highlighting only the most important and interesting ideas, which can get lost amid a snowstorm of detail in conventional texts. The book is aimed at a wide readership, and assumes only some knowledge of elementary calculus. There are exercises (with full solutions) and simple but powerful computer programs which are suitable even for readers with no previous computing experience. David Acheson's book will inspire new students by providing a foretaste of more advanced mathematics and showing just how interesting the subject can be.

**The Generalized Riemann Integral** - Robert M. McLeod 1980-12-31

The Generalized Riemann Integral is addressed to persons who already have an acquaintance with integrals they wish to extend and to the teachers of generations of students to come. The organization of the work will make it possible for the first group to extract the principal results without struggling through technical details which they may find formidable or extraneous to their purposes. The technical level starts low at the opening of each chapter. Thus, readers may follow each chapter as far as they wish and then skip to the beginning of the next. To readers who do wish to see all the details of the arguments, they are given. The generalized Riemann integral can be used to bring the full power of the integral within the reach of many who, up to now, haven't gotten a glimpse of such results as monotone and dominated convergence theorems. As its name hints, the generalized Riemann integral is

defined in terms of Riemann sums. The path from the definition to theorems exhibiting the full power of the integral is direct and short.

**Journey through Genius** - William Dunham 1991-08-01

Like masterpieces of art, music, and literature, great mathematical theorems are creative milestones, works of genius destined to last forever. Now William Dunham gives them the attention they deserve. Dunham places each theorem within its historical context and explores the very human and often turbulent life of the creator – from Archimedes, the absentminded theoretician whose absorption in his work often precluded eating or bathing, to Gerolamo Cardano, the sixteenth-century mathematician whose accomplishments flourished despite a bizarre array of misadventures, to the paranoid genius of modern times, Georg Cantor. He also provides step-by-step proofs for the theorems, each easily accessible to readers with no more than a knowledge of high school mathematics. A rare combination of the historical, biographical, and mathematical, *Journey Through Genius* is a fascinating introduction to a neglected field of human creativity. "It is mathematics presented as a series of works of art; a fascinating lingering over individual examples of ingenuity and insight. It is mathematics by lightning flash." –Isaac Asimov

*Elementary Analysis* - Kenneth A. Ross 2014-01-15

*Infinite Powers* - Steven Strogatz 2019

From preeminent math personality and author of *The Joy of x*, a brilliant and endlessly appealing explanation of calculus - how it works and why it makes our lives immeasurably better. Without calculus, we wouldn't have cell phones, TV, GPS, or ultrasound. We wouldn't have unraveled DNA or discovered Neptune or figured out how to put 5,000 songs in your pocket. Though many of us were scared away from this essential, engrossing subject in high school and college, Steven Strogatz's brilliantly creative, down-to-earth history shows that calculus is not about complexity; it's about simplicity. It harnesses an unreal number--infinity--to tackle real-world problems, breaking them down into easier ones and then reassembling the answers into solutions that feel miraculous. *Infinite Powers* recounts how calculus tantalized and thrilled its inventors, starting with its first glimmers in ancient Greece and bringing us right up to the discovery of gravitational waves (a phenomenon predicted by calculus). Strogatz reveals how this form of math rose to the challenges of each age: how to determine the area of a circle with only sand and a stick; how to explain why Mars goes "backwards" sometimes; how to make electricity with magnets; how to ensure your rocket doesn't miss the moon; how to turn the tide in the fight against AIDS. As Strogatz proves, calculus is truly the language of the universe. By unveiling the principles of that language, *Infinite Powers* makes us marvel at the world anew.

*To Infinity and Beyond* - Eli Maor 2017-11-21

Eli Maor examines the role of infinity in mathematics and geometry and its cultural impact on the arts and sciences. He evokes the profound intellectual impact the infinite has exercised on the human mind, from the "horror infiniti" of the Greeks to the works of M.C. Escher; from the ornamental designs of the Moslems, to the sage Giordano Bruno, whose belief in an infinite universe led to his death at the hands of the Inquisition. But above all, the book describes

the mathematician's fascination with infinity, a fascination mingled with puzzlement. "Maor explores the idea of infinity in mathematics and in art and argues that this is the point of contact between the two, best exemplified by the work of the Dutch artist M.C. Escher, six of whose works are shown here in beautiful color plates."--Los Angeles Times "[Eli Maor's] enthusiasm for the topic carries the reader through a rich panorama." Choice "Fascinating and enjoyable.... places the ideas of infinity in a cultural context and shows how they have been espoused and molded by mathematics."-Science.

**e: The Story of a Number** - Eli Maor 2011-10-12

The interest earned on a bank account, the arrangement of seeds in a sunflower, and the shape of the Gateway Arch in St. Louis are all intimately connected with the mysterious number  $e$ . In this informal and engaging history, Eli Maor portrays the curious characters and the elegant mathematics that lie behind the number. Designed for a reader with only a modest mathematical background, this biography brings out the central importance of  $e$  to mathematics and illuminates a golden era in the age of science.

*The Calculus of Complex Functions* - William Johnston 2022-04-01

The book introduces complex analysis as a natural extension of the calculus of real-valued functions. The mechanism for doing so is the extension theorem, which states that any real analytic function extends to an analytic function defined in a region of the complex plane. The connection to real functions and calculus is then natural. The introduction to analytic functions feels intuitive and their fundamental properties are covered quickly. As a result, the book allows a surprisingly large coverage of the classical analysis topics of analytic and meromorphic functions, harmonic functions, contour integrals and series representations, conformal maps, and the Dirichlet problem. It also introduces several more advanced notions, including the Riemann hypothesis and operator theory, in a manner accessible to undergraduates. The last chapter describes bounded linear operators on Hilbert and Banach spaces, including the spectral theory of compact operators, in a way that also provides an excellent review of important topics in linear algebra and provides a pathway to undergraduate research topics in analysis. The book allows flexible use in a single semester, full-year, or capstone course in complex analysis.

Prerequisites can range from only multivariate calculus to a transition course or to linear algebra or real analysis. There are over one thousand exercises of a variety of types and levels. Every chapter contains an essay describing a part of the history of the subject and at least one connected collection of exercises that together comprise a project-level exploration.

**The Calculus of Happiness** - Oscar Fernandez 2019-07-09

How math holds the keys to improving one's health, wealth, and love life? What's the best diet for overall health and weight management? How can we change our finances to retire earlier? How can we maximize our chances of finding our soul mate? In *The Calculus of Happiness*, Oscar Fernandez shows us that math yields powerful insights into health, wealth, and love. Using only high-school-level math (precalculus with a dash of calculus), Fernandez guides us through several of the surprising results, including an easy rule of thumb for choosing foods that lower our risk for developing diabetes (and that help us lose weight too), simple "all-weather" investment portfolios with great

returns, and math-backed strategies for achieving financial independence and searching for our soul mate. Moreover, the important formulas are linked to a dozen free online interactive calculators on the book's website, allowing one to personalize the equations. Fernandez uses everyday experiences--such as visiting a coffee shop--to provide context for his mathematical insights, making the math discussed more accessible, real-world, and relevant to our daily lives. Every chapter ends with a summary of essential lessons and takeaways, and for advanced math fans, Fernandez includes the mathematical derivations in the appendices. A nutrition, personal finance, and relationship how-to guide all in one, *The Calculus of Happiness* invites you to discover how empowering mathematics can be.

The Historical Development of the Calculus - C.H.Jr. Edwards 2012-12-06

The calculus has served for three centuries as the principal quantitative language of Western science. In the course of its genesis and evolution some of the most fundamental problems of mathematics were first confronted and, through the persistent labors of successive generations, finally resolved. Therefore, the historical development of the calculus holds a special interest for anyone who appreciates the value of a historical perspective in teaching, learning, and enjoying mathematics and its applications. My goal in writing this book was to present an account of this development that is accessible, not solely to students of the history of mathematics, but to the wider mathematical community for which my exposition is more specifically intended, including those who study, teach, and use calculus. The scope of this account can be delineated partly by comparison with previous works in the same general area. M. E. Baron's *The Origins of the Infinitesimal Calculus* (1969) provides an informative and reliable treatment of the precalculus period up to, but not including (in any detail), the time of Newton and Leibniz, just when the interest and pace of the story begin to quicken and intensify. C. B. Boyer's well-known book (1949, 1959 reprint) met well the goals its author set for it, but it was more appropriately titled in its original edition--*The Concepts of the Calculus* than in its reprinting.

**American Prometheus** - Kai Bird 2007-12-18

PULITZER PRIZE WINNER • The definitive biography of J. Robert Oppenheimer, one of the iconic figures of the twentieth century, a brilliant physicist who led the effort to build the atomic bomb for his country in a time of war, and who later found himself confronting the moral consequences of scientific progress. THE INSPIRATION FOR THE UPCOMING MAJOR MOTION PICTURE OPPENHEIMER In this magisterial, acclaimed biography twenty-five years in the making, Kai Bird and Martin Sherwin capture Oppenheimer's life and times, from his early career to his central role in the Cold War. This is biography and history at its finest, riveting and deeply informative. "A masterful account of Oppenheimer's rise and fall, set in the context of the turbulent decades of America's own transformation. It is a tour de force." --Los Angeles Times Book Review "A work of voluminous scholarship and lucid insight, unifying its multifaceted portrait with a keen grasp of Oppenheimer's essential nature... It succeeds in deeply fathoming his most damaging, self-contradictory behavior." --The New York Times

Calculus Reordered - David M. Bressoud 2021-05-04

*Calculus Reordered* takes readers on a remarkable journey through hundreds of

years to tell the story of how calculus grew to what we know today. David Bressoud explains why calculus is credited to Isaac Newton and Gottfried Leibniz in the seventeenth century, and how its current structure is based on developments that arose in the nineteenth century. Bressoud argues that a pedagogy informed by the historical development of calculus presents a sounder way for students to learn this fascinating area of mathematics. Delving into calculus's birth in the Hellenistic Eastern Mediterranean--especially Syracuse in Sicily and Alexandria in Egypt--as well as India and the Islamic Middle East, Bressoud considers how calculus developed in response to essential questions emerging from engineering and astronomy. He looks at how Newton and Leibniz built their work on a flurry of activity that occurred throughout Europe, and how Italian philosophers such as Galileo Galilei played a particularly important role. In describing calculus's evolution, Bressoud reveals problems with the standard ordering of its curriculum: limits, differentiation, integration, and series. He contends instead that the historical order--which follows first integration as accumulation, then differentiation as ratios of change, series as sequences of partial sums, and finally limits as they arise from the algebra of inequalities--makes more sense in the classroom environment. Exploring the motivations behind calculus's discovery, *Calculus Reordered* highlights how this essential tool of mathematics came to be.

Euler: The Master of Us All - William Dunham 2020-07-29

Recipient of the Mathematical Association of America's Beckenbach Book Prize in 2008! Leonhard Euler was one of the most prolific mathematicians that have ever lived. This book examines the huge scope of mathematical areas explored and developed by Euler, which includes number theory, combinatorics, geometry, complex variables and many more. The information known to Euler over 300 years ago is discussed, and many of his advances are reconstructed. Readers will be left in no doubt about the brilliance and pervasive influence of Euler's work.

Impossible? - Julian Havil 2011-03-28

In *Nonplussed!*, popular-math writer Julian Havil delighted readers with a mind-boggling array of implausible yet true mathematical paradoxes. Now Havil is back with *Impossible?*, another marvelous medley of the utterly confusing, profound, and unbelievable--and all of it mathematically irrefutable. Whenever Forty-second Street in New York is temporarily closed, traffic doesn't gridlock but flows more smoothly--why is that? Or consider that cities that build new roads can experience dramatic increases in traffic congestion--how is this possible? What does the game show *Let's Make A Deal* reveal about the unexpected hazards of decision-making? What can the game of cricket teach us about the surprising behavior of the law of averages? These are some of the counterintuitive mathematical occurrences that readers encounter in *Impossible?* Havil ventures further than ever into territory where intuition can lead one astray. He gathers entertaining problems from probability and statistics along with an eclectic variety of conundrums and puzzlers from other areas of mathematics, including classics of abstract math like the Banach-Tarski paradox. These problems range in difficulty from easy to highly challenging, yet they can be tackled by anyone with a background in calculus. And the fascinating history and personalities associated with many of the problems are

included with their mathematical proofs. Impossible? will delight anyone who wants to have their reason thoroughly confounded in the most astonishing and unpredictable ways.

The Genius of Euler: Reflections on his Life and Work - William Dunham  
2020-08-03

**The History of the Calculus and Its Conceptual Development** - Carl B. Boyer  
2012-10-09

Fluent description of the development of both the integral and differential calculus – its early beginnings in antiquity, medieval contributions, and a consideration of Newton and Leibniz.

**Count Like an Egyptian** - David Reimer 2014-04-27

A lively collection of fun and challenging problems in ancient Egyptian math. The mathematics of ancient Egypt was fundamentally different from our math today. Contrary to what people might think, it wasn't a primitive forerunner of modern mathematics. In fact, it can't be understood using our current computational methods. Count Like an Egyptian provides a fun, hands-on introduction to the intuitive and often-surprising art of ancient Egyptian math. David Reimer guides you step-by-step through addition, subtraction, multiplication, and more. He even shows you how fractions and decimals may have been calculated—they technically didn't exist in the land of the pharaohs. You'll be counting like an Egyptian in no time, and along the way you'll learn firsthand how mathematics is an expression of the culture that uses it, and why there's more to math than rote memorization and bewildering abstraction. Reimer takes you on a lively and entertaining tour of the ancient Egyptian world, providing rich historical details and amusing anecdotes as he presents a host of mathematical problems drawn from different eras of the Egyptian past. Each of these problems is like a tantalizing puzzle, often with a beautiful and elegant solution. As you solve them, you'll be immersed in many facets of Egyptian life, from hieroglyphs and pyramid building to agriculture, religion, and even bread baking and beer brewing. Fully illustrated in color throughout, Count Like an Egyptian also teaches you some Babylonian computation—the precursor to our modern system—and compares ancient Egyptian mathematics to today's math, letting you decide for yourself which is better.

**Infinity and the Mind** - Rudy Rucker 2019-07-23

A dynamic exploration of infinity. In *Infinity and the Mind*, Rudy Rucker leads an excursion to that stretch of the universe he calls the "Mindscape," where he explores infinity in all its forms: potential and actual, mathematical and physical, theological and mundane. Using cartoons, puzzles, and quotations to enliven his text, Rucker acquaints us with staggeringly advanced levels of infinity, delves into the depths beneath daily awareness, and explains Kurt Gödel's belief in the possibility of robot consciousness. In the realm of infinity, mathematics, science, and logic merge with the fantastic. By closely examining the paradoxes that arise, we gain profound insights into the human mind, its powers, and its limitations. This Princeton Science Library edition includes a new preface by the author.

Calculus Deconstructed - Zbigniew H. Nitecki 2022-01-11

Calculus Deconstructed is a thorough and mathematically rigorous exposition of

single-variable calculus for readers with some previous exposure to calculus techniques but not to methods of proof. This book is appropriate for a beginning Honors Calculus course assuming high school calculus or a "bridge course" using basic analysis to motivate and illustrate mathematical rigor. It can serve as a combination textbook and reference book for individual self-study. Standard topics and techniques in single-variable calculus are presented in context of a coherent logical structure, building on familiar properties of real numbers and teaching methods of proof by example along the way. Numerous examples reinforce both practical and theoretical understanding, and extensive historical notes explore the arguments of the originators of the subject. No previous experience with mathematical proof is assumed: rhetorical strategies and techniques of proof (reductio ad absurdum, induction, contrapositives, etc.) are introduced by example along the way. Between the text and exercises, proofs are available for all the basic results of calculus for functions of one real variable.

The Calculus Gallery - William Dunham 2018-11-13

More than three centuries after its creation, calculus remains a dazzling intellectual achievement and the gateway to higher mathematics. This book charts its growth and development by sampling from the work of some of its foremost practitioners, beginning with Isaac Newton and Gottfried Wilhelm Leibniz in the late seventeenth century and continuing to Henri Lebesgue at the dawn of the twentieth. Now with a new preface by the author, this book documents the evolution of calculus from a powerful but logically chaotic subject into one whose foundations are thorough, rigorous, and unflinching—a story of genius triumphing over some of the toughest, subtlest problems imaginable. In touring The Calculus Gallery, we can see how it all came to be.

**The Mathematical Universe** - William Dunham 1997-02-18

"Dunham writes for nonspecialists, and they will enjoy his piquant anecdotes and amusing asides -- Booklist "Artfully, Dunham conducts a tour of the mathematical universe. . . he believes these ideas to be accessible to the audience he wants to reach, and he writes so that they are." -- Nature "If you want to encourage anyone's interest in math, get them The Mathematical Universe." \* New Scientist

**The G. H. Hardy Reader** - Donald J. Albers 2016-04-11

G. H. Hardy ranks among the greatest twentieth-century mathematicians. This book introduces this extraordinary individual and his writing.

**Measure, Integration & Real Analysis** - Sheldon Axler 2019-11-29

This open access textbook welcomes students into the fundamental theory of measure, integration, and real analysis. Focusing on an accessible approach, Axler lays the foundations for further study by promoting a deep understanding of key results. Content is carefully curated to suit a single course, or two-semester sequence of courses, creating a versatile entry point for graduate studies in all areas of pure and applied mathematics. Motivated by a brief review of Riemann integration and its deficiencies, the text begins by immersing students in the concepts of measure and integration. Lebesgue measure and abstract measures are developed together, with each providing key insight into the main ideas of the other approach. Lebesgue integration links into results such as the Lebesgue Differentiation Theorem. The development of

products of abstract measures leads to Lebesgue measure on  $\mathbb{R}^n$ . Chapters on Banach spaces,  $L_p$  spaces, and Hilbert spaces showcase major results such as the Hahn–Banach Theorem, Hölder’s Inequality, and the Riesz Representation Theorem. An in-depth study of linear maps on Hilbert spaces culminates in the Spectral Theorem and Singular Value Decomposition for compact operators, with an optional interlude in real and complex measures. Building on the Hilbert space material, a chapter on Fourier analysis provides an invaluable introduction to Fourier series and the Fourier transform. The final chapter offers a taste of probability. Extensively class tested at multiple universities and written by an award-winning mathematical expositor, *Measure, Integration & Real Analysis* is an ideal resource for students at the start of their journey into graduate mathematics. A prerequisite of elementary undergraduate real analysis is assumed; students and instructors looking to reinforce these ideas will appreciate the electronic Supplement for *Measure, Integration & Real Analysis* that is freely available online.

**Theorems, Corollaries, Lemmas, and Methods of Proof** - Richard J. Rossi  
2011-10-05

A hands-on introduction to the tools needed for rigorous and theoretical mathematical reasoning. Successfully addressing the frustration many students experience as they make the transition from computational mathematics to advanced calculus and algebraic structures, *Theorems, Corollaries, Lemmas, and Methods of Proof* equips students with the tools needed to succeed while providing a firm foundation in the axiomatic structure of modern mathematics. This essential book:

- \* Clearly explains the relationship between definitions, conjectures, theorems, corollaries, lemmas, and proofs
- \* Reinforces the foundations of calculus and algebra
- \* Explores how to use both a direct and indirect proof to prove a theorem
- \* Presents the basic properties of real numbers
- \* Discusses how to use mathematical induction to prove a theorem
- \* Identifies the different types of theorems
- \* Explains how to write a clear and understandable proof
- \* Covers the basic structure of modern mathematics and the key components of modern mathematics

A complete chapter is dedicated to the different methods of proof such as forward direct proofs, proof by contrapositive, proof by contradiction, mathematical induction, and existence proofs. In addition, the author has supplied many clear and detailed algorithms that outline these proofs. *Theorems, Corollaries, Lemmas, and Methods of Proof* uniquely introduces scratch work as an indispensable part of the proof process, encouraging students to use scratch work and creative thinking as the first steps in their attempt to prove a theorem. Once their scratch work successfully demonstrates the truth of the theorem, the proof can be written in a clear and concise fashion. The basic structure of modern mathematics is discussed, and each of the key components of modern mathematics is defined. Numerous exercises are included in each chapter, covering a wide range of topics with varied levels of difficulty. Intended as a main text for mathematics courses such as *Methods of Proof*, *Transitions to Advanced Mathematics*, and *Foundations of Mathematics*, the book may also be used as a supplementary textbook in junior- and senior-level courses on advanced calculus, real analysis, and modern algebra.

**Georg Cantor** - Joseph Warren Dauben 2020-06-16

One of the greatest revolutions in mathematics occurred when Georg Cantor (1845-1918) promulgated his theory of transfinite sets. This revolution is the subject of Joseph Dauben's important study, the most thorough yet written of the philosopher and mathematician who was once called a "corrupter of youth" for an innovation that is now a vital component of elementary school curricula. Set theory has been widely adopted in mathematics and philosophy, but the controversy surrounding it at the turn of the century remains of great interest. Cantor's own faith in his theory was partly theological. His religious beliefs led him to expect paradoxes in any concept of the infinite, and he always retained his belief in the utter veracity of transfinite set theory. Later in his life, he was troubled by recurring attacks of severe depression. Dauben shows that these played an integral part in his understanding and defense of set theory.

*A Course in Complex Analysis* - Saeed Zakeri 2021-11-02

"This textbook is intended for a year-long graduate course on complex analysis, a branch of mathematical analysis that has broad applications, particularly in physics, engineering, and applied mathematics. Based on nearly twenty years of classroom lectures, the book is accessible enough for independent study, while the rigorous approach will appeal to more experienced readers and scholars, propelling further research in this field. While other graduate-level complex analysis textbooks do exist, Zakeri takes a distinctive approach by highlighting the geometric properties and topological underpinnings of this area. Zakeri includes more than three hundred and fifty problems, with problem sets at the end of each chapter, along with additional solved examples. Background knowledge of undergraduate analysis and topology is needed, but the thoughtful examples are accessible to beginning graduate students and advanced undergraduates. At the same time, the book has sufficient depth for advanced readers to enhance their own research. The textbook is well-written, clearly illustrated, and peppered with historical information, making it approachable without sacrificing rigor. It is poised to be a valuable textbook for graduate students, filling a needed gap by way of its level and unique approach"--

*Calculus Simplified* - Oscar Fernandez 2019-06-11

"In *Calculus simplified*, Oscar Fernandez combines the strengths and omits the weaknesses, resulting in a "Goldilocks approach" to learning calculus : just the right level of detail, the right depth of insights, and the flexibility to customize your calculus adventure."--Page 4 de la couverture.

*The Command to Look* - William Mortensen 2014-09-29

*The Command to Look* was one of William Mortensen's most influential and sought-after books, and has been out of print for fifty years. Reproduced here in full, this book includes an essay by Michael Moynihan on how its images influenced the occult "lesser magic" of the founder of the Church of Satan, Anton Szandor LaVey. The book reproduces fifty-five images of Mortensen's best work and text by the wittiest and most biting writers on photography of their time.

**The Irrationals** - Julian Havil 2012-07-22

The ancient Greeks discovered them, but it wasn't until the nineteenth century that irrational numbers were properly understood and rigorously defined, and even today not all their mysteries have been revealed. In *The Irrationals*, the

first popular and comprehensive book on the subject, Julian Havil tells the story of irrational numbers and the mathematicians who have tackled their challenges, from antiquity to the twenty-first century. Along the way, he explains why irrational numbers are surprisingly difficult to define—and why so many questions still surround them. Fascinating and illuminating, this is a book for everyone who loves math and the history behind it.

Mathematical Constants II - Steven R. Finch 2018-12-06

Famous mathematical constants include the ratio of circular circumference to diameter,  $\pi = 3.14 \dots$ , and the natural logarithm base,  $e = 2.718 \dots$ . Students and professionals can often name a few others, but there are many more buried in the literature and awaiting discovery. How do such constants arise, and why are they important? Here the author renews the search he began in his book *Mathematical Constants*, adding another 133 essays that broaden the landscape. Topics include the minimality of soap film surfaces, prime numbers, elliptic curves and modular forms, Poisson–Voronoi tessellations, random triangles, Brownian motion, uncertainty inequalities, Prandtl–Blasius flow (from fluid dynamics), Lyapunov exponents, knots and tangles, continued fractions, Galton–Watson trees, electrical capacitance (from potential theory), Zermelo's navigation problem, and the optimal control of a pendulum. Unsolved problems appear virtually everywhere as well. This volume continues an outstanding scholarly attempt to bring together all significant mathematical constants in one place.

*Euler's Gem* - David S. Richeson 2019-07-23

How a simple equation reshaped mathematics Leonhard Euler's polyhedron formula describes the structure of many objects—from soccer balls and gemstones to Buckminster Fuller's buildings and giant all-carbon molecules. Yet Euler's theorem is so simple it can be explained to a child. From ancient Greek geometry to today's cutting-edge research, Euler's Gem celebrates the discovery of Euler's beloved polyhedron formula and its far-reaching impact on topology, the study of shapes. Using wonderful examples and numerous illustrations, David Richeson presents this mathematical idea's many elegant and unexpected applications, such as showing why there is always some windless spot on earth, how to measure the acreage of a tree farm by counting trees, and how many crayons are needed to color any map. Filled with a who's who of brilliant mathematicians who questioned, refined, and contributed to a remarkable theorem's development, Euler's Gem will fascinate every mathematics enthusiast. This paperback edition contains a new preface by the author.

**The Equation that Couldn't Be Solved** - Mario Livio 2005-09-19

What do Bach's compositions, Rubik's Cube, the way we choose our mates, and the physics of subatomic particles have in common? All are governed by the laws of symmetry, which elegantly unify scientific and artistic principles. Yet the mathematical language of symmetry—known as group theory—did not emerge from the study of symmetry at all, but from an equation that couldn't be solved. For thousands of years mathematicians solved progressively more difficult algebraic equations, until they encountered the quintic equation, which resisted solution for three centuries. Working independently, two great prodigies ultimately proved that the quintic cannot be solved by a simple formula. These geniuses, a Norwegian named Niels Henrik Abel and a romantic Frenchman named Évariste

Galois, both died tragically young. Their incredible labor, however, produced the origins of group theory. The first extensive, popular account of the mathematics of symmetry and order, *The Equation That Couldn't Be Solved* is told not through abstract formulas but in a beautifully written and dramatic account of the lives and work of some of the greatest and most intriguing mathematicians in history.

**The Calculus Gallery** - William Dunham 2018-11-13

More than three centuries after its creation, calculus remains a dazzling intellectual achievement and the gateway to higher mathematics. This book charts its growth and development by sampling from the work of some of its foremost practitioners, beginning with Isaac Newton and Gottfried Wilhelm Leibniz in the late seventeenth century and continuing to Henri Lebesgue at the dawn of the twentieth. Now with a new preface by the author, this book documents the evolution of calculus from a powerful but logically chaotic subject into one whose foundations are thorough, rigorous, and unflinching—a story of genius triumphing over some of the toughest, subtlest problems imaginable. In touring *The Calculus Gallery*, we can see how it all came to be.

**When Least Is Best** - Paul J. Nahin 2021-05-18

A mathematical journey through the most fascinating problems of extremes and how to solve them. What is the best way to photograph a speeding bullet? How can lost hikers find their way out of a forest? Why does light move through glass in the least amount of time possible? *When Least Is Best* combines the mathematical history of extrema with contemporary examples to answer these intriguing questions and more. Paul Nahin shows how life often works at the extremes—with values becoming as small (or as large) as possible—and he considers how mathematicians over the centuries, including Descartes, Fermat, and Kepler, have grappled with these problems of minima and maxima. Throughout, Nahin examines entertaining conundrums, such as how to build the shortest bridge possible between two towns, how to vary speed during a race, and how to make the perfect basketball shot. Moving from medieval writings and modern calculus to the field of optimization, the engaging and witty explorations of *When Least Is Best* will delight math enthusiasts everywhere.

*Mathematics of the 19th Century* - A.N. Kolmogorov 2001-03

This multi-authored effort, *Mathematics of the nineteenth century* (to be followed by *Mathematics of the twentieth century*), is a sequel to the *History of mathematics from antiquity to the early nineteenth century*, published in three volumes from 1970 to 1972. For reasons explained below, our discussion of twentieth-century mathematics ends with the 1930s. Our general objectives are identical with those stated in the preface to the three-volume edition, i. e. , we consider the development of mathematics not simply as the process of perfecting concepts and techniques for studying real-world spatial forms and quantitative relationships but as a social process as well. Mathematical structures, once established, are capable of a certain degree of autonomous development. In the final analysis, however, such immanent mathematical evolution is conditioned by practical activity and is either self-directed or, as is most often the case, is determined by the needs of society. Proceeding from this premise, we intend, first, to unravel the forces that shape mathematical progress. We examine the interaction of mathematics with the social

structure, technology, the natural sciences, and philosophy. Through an analysis of mathematical history proper, we hope to delineate the relationships among the various mathematical disciplines and to evaluate mathematical achievements in the light of the current state and future prospects of the science. The difficulties confronting us considerably exceeded those encountered in preparing the three-volume edition.

Engineering in History - Richard Shelton Kirby 1990-08-01

Broad, nontechnical survey of history's major technological advances: birth of Greek science, Industrial Revolution, electricity and applied science, 20th-century automation, much more. 181 illustrations. "Excellent." ? Isis.

**Curves for the Mathematically Curious** - Julian Havil 2021-11-02

Ten amazing curves personally selected by one of today's most important math writers *Curves for the Mathematically Curious* is a thoughtfully curated collection of ten mathematical curves, selected by Julian Havil for their significance, mathematical interest, and beauty. Each chapter gives an account of the history and definition of one curve, providing a glimpse into the elegant and often surprising mathematics involved in its creation and evolution. In telling the ten stories, Havil introduces many mathematicians and other innovators, some whose fame has withstood the passing of years and others who have slipped into comparative obscurity. You will meet Pierre Bézier, who is known for his ubiquitous and eponymous curves, and Adolphe Quetelet, who trumpeted the ubiquity of the normal curve but whose name now hides behind the modern body mass index. These and other ingenious thinkers engaged with the challenges, incongruities, and insights to be found in these remarkable curves—and now you can share in this adventure. *Curves for the Mathematically Curious* is a rigorous and enriching mathematical experience for anyone interested in curves, and the book is designed so that readers who choose can follow the details with pencil and paper. Every curve has a story worth telling.

Mathematical Constants - Steven R. Finch 2003-08-18

Steven Finch provides 136 essays, each devoted to a mathematical constant or a class of constants, from the well known to the highly exotic. This book is helpful both to readers seeking information about a specific constant, and to readers who desire a panoramic view of all constants coming from a particular field, for example, combinatorial enumeration or geometric optimization. Unsolved problems appear virtually everywhere as well. This work represents an outstanding scholarly attempt to bring together all significant mathematical constants in one place.

*An Imaginary Tale* - Paul J. Nahin 2010-02-22

Today complex numbers have such widespread practical use--from electrical engineering to aeronautics--that few people would expect the story behind their derivation to be filled with adventure and enigma. In *An Imaginary Tale*, Paul Nahin tells the 2000-year-old history of one of mathematics' most elusive numbers, the square root of minus one, also known as  $i$ . He recreates the baffling mathematical problems that conjured it up, and the colorful characters who tried to solve them. In 1878, when two brothers stole a mathematical papyrus from the ancient Egyptian burial site in the Valley of Kings, they led scholars to the earliest known occurrence of the square root of a negative

number. The papyrus offered a specific numerical example of how to calculate the volume of a truncated square pyramid, which implied the need for  $i$ . In the first century, the mathematician-engineer Heron of Alexandria encountered  $i$  in a separate project, but fudged the arithmetic; medieval mathematicians stumbled upon the concept while grappling with the meaning of negative numbers, but dismissed their square roots as nonsense. By the time of Descartes, a theoretical use for these elusive square roots--now called "imaginary numbers"--was suspected, but efforts to solve them led to intense, bitter debates. The notorious  $i$  finally won acceptance and was put to use in complex analysis and theoretical physics in Napoleonic times. Addressing readers with both a general and scholarly interest in mathematics, Nahin weaves into this narrative entertaining historical facts and mathematical discussions, including the application of complex numbers and functions to important problems, such as Kepler's laws of planetary motion and ac electrical circuits. This book can be read as an engaging history, almost a biography, of one of the most evasive and pervasive "numbers" in all of mathematics. Some images inside the book are unavailable due to digital copyright restrictions.

[A Radical Approach to Lebesgue's Theory of Integration](#) - David M. Bressoud  
2008-01-21

Meant for advanced undergraduate and graduate students in mathematics, this introduction to measure theory and Lebesgue integration is motivated by the historical questions that led to its development. The author tells the story of the mathematicians who wrestled with the difficulties inherent in the Riemann integral, leading to the work of Jordan, Borel, and Lebesgue.