PRINCETON

Mathematics
2019

"We often claim that education should not just teach facts; it should help us learn how to think clearly. [This] is a book that takes that goal seriously. It is brilliantly constructed, clearly written, and fun."
—William C. Powers Jr., former president of the University of Texas, Austin

Making Up Your Own Mind

We solve countless problems—big and small—every day. With so much practice, why do we often have trouble making simple decisions—much less arriving at optimal solutions to important questions? Is there a practical way to learn to think more effectively and creatively? Edward Burger shows how we can become far better at solving real-world problems by learning creative puzzle-solving skills using simple, effective thinking techniques.

EDWARD B. BURGER is the president of Southwestern University, a mathematics professor, and a leading teacher on thinking, innovation, and creativity. He has written more than seventy research articles, video series, and books, including *The 5 Elements of Effective Thinking* (with Michael Starbird) (Princeton).
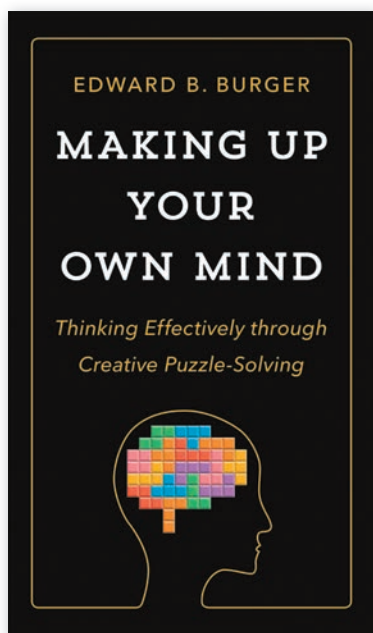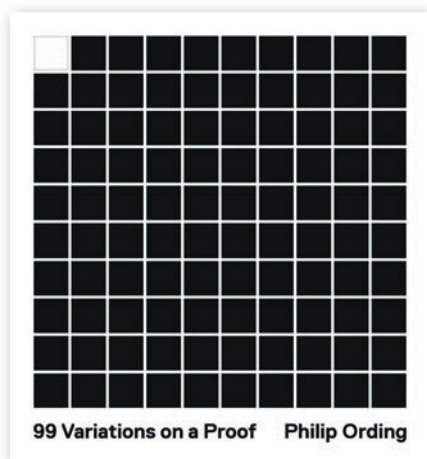
2018. 136 pages. 35 b/w illus. 4 ½ x 7 ½.
Hardback 9780691182780 $19.95 | £14.99
E-book 9780691188881   Audiobook 9780691193014

"Much of today's college talk revolves around getting in—but this book meaningfully shifts the focus to how to be successful once getting to college. Johnson provides expert advice to make this book an important and eye-opening read."
—Sarah Graham, director of college counseling, Princeton Day School

Will This Be on the Test?

This is the essential survival guide for high-school students making the transition to college academics. Dana Johnson shares wisdom and wit gleaned from her decades of experience as an award-winning teacher in the freshman classroom—lessons that will continue to serve you long after college graduation.

DANA T. JOHNSON taught for many years at the College of William and Mary, where she twice won the Simon Prize for Excellence in the Teaching of Mathematics. **JENNIFER E. PRICE** is a biologist who has much experience teaching online as well as traditional college courses.

May 2019. 192 pages. 33 b/w illus. 5 ½ x 8 ½.
Hardback 9780691179537 $19.95 | £14.99
E-book 9780691189451   Audiobook 9780691193526

February 2019. 272 pages. 1 color + 25 b/w illus. 8 ½ x 9.
Hardback 9780691158839 $24.95 | £20.00
E-book 9780691185422

99 Variations on a Proof

This book offers a multifaceted perspective on mathematics by demonstrating 99 different proofs of the same theorem. Each chapter solves an otherwise unremarkable equation in distinct historical, formal, and imaginative styles that range from Medieval, Topological, and Doggerel to Chromatic, Electrostatic, and Psychedelic. With humor and scholarly aplomb, Philip Ording weaves these variations into an accessible and wide-ranging narrative on the nature and practice of mathematics. Readers will gain not only a bird's-eye view of the discipline but also new insights into its historical, philosophical, and cultural nuances.

PHILIP ORDING is professor of mathematics at Sarah Lawrence College. He is the coeditor of *Simplicity: Ideals of Practice in Mathematics and the Arts*.
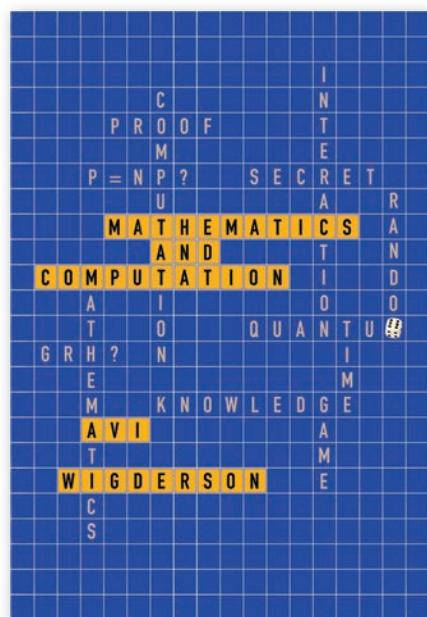
May 2019. 488 pages. 25 b/w illus. 7 x 10.
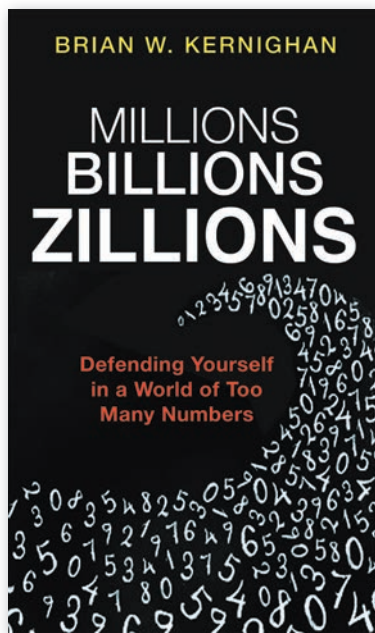Hardback 9780691189130 $49.95 | £40.00
E-book 9780691192543

Mathematics and Computation

This book provides a broad, conceptual overview of computational complexity theory—the mathematical study of efficient computation. With important practical applications to computer science and industry, computational complexity theory has evolved into a highly interdisciplinary field, with strong links to most mathematical areas and to a growing number of scientific endeavors. Useful for undergraduates in mathematics and computer science as well as researchers and teachers in the field, *Mathematics and Computation* brings conceptual clarity to this central and dynamic scientific discipline.

AVI WIGDERSON is the Herbert H. Maass Professor in the School of Mathematics at the Institute for Advanced Study in Princeton, New Jersey.
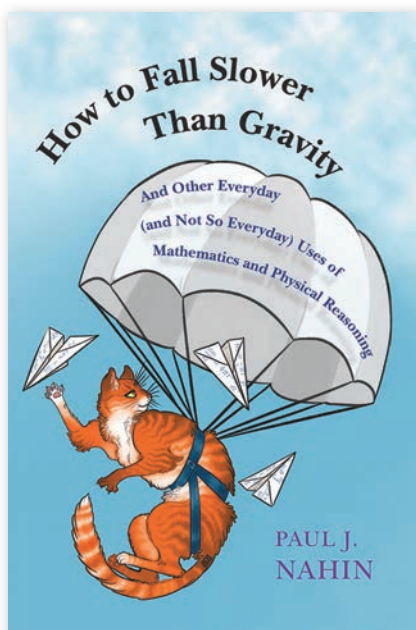
"This sophisticated, rich, and accessible book walks us through something we all need but are almost never taught: number sense. The reader is left with real skills and confidence about understanding and interpreting numbers, probabilities, graphics, and much more."
—Zeynep Tufekci, contributing opinion writer for the *New York Times*

Millions, Billions, Zillions

Numbers are often intimidating, confusing, and even deliberately deceptive—especially when they are really big. The media loves to report on millions, billions, and trillions, but frequently makes basic mistakes or presents such numbers in misleading ways. And misunderstanding numbers can have serious consequences. Giving you the simple tools you need to avoid being fooled by dubious numbers, *Millions, Billions, Zillions* is an essential survival guide for a world drowning in big—and often bad—data.

BRIAN W. KERNIGHAN is professor of computer science at Princeton University. His many books include *Understanding the Digital World* (Princeton).
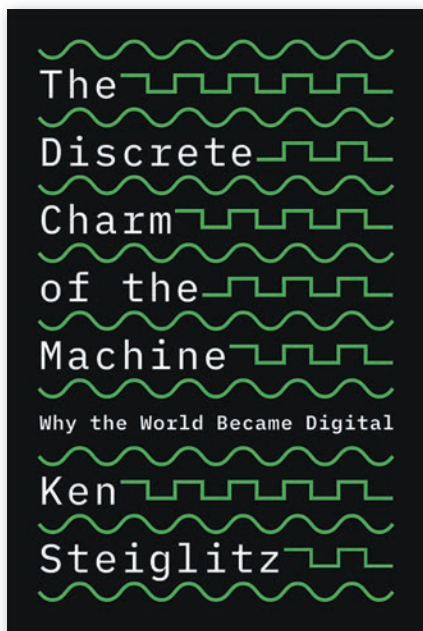
2018. 176 pages. 30 b/w illus. 4 ½ x 7 ½.
Hardback 9780691182773 $22.95 | £17.99
E-book 9780691190136

"Nahin captures the soul of mathematical physics in tall tales and delightful stories that invite the reader to relive the calculations that guided great inventors and pioneers throughout history."
—Christopher G. Tully, author of *Elementary Particle Physics in a Nutshell*

How to Fall Slower Than Gravity

Paul Nahin is a master at explaining odd phenomena through straightforward mathematics. In this collection of twenty-six intriguing problems, he explores how mathematical physicists think. Nahin's goal is to guide readers—who will need only to have studied advanced high school math and physics—in expanding their mathematical thinking to make sense of the curiosities of the physical world. More than a puzzle book, this work will immerse you in the delights of scientific history while honing your math skills.

PAUL J. NAHIN is the author of many popular math books. He is professor emeritus of electrical engineering at the University of New Hampshire. He received the 2017 Chandler Davis Prize for Excellence in Expository Writing in Mathematics.

2018. 320 pages. 62 b/w illus. 4 tables. 6 x 9.
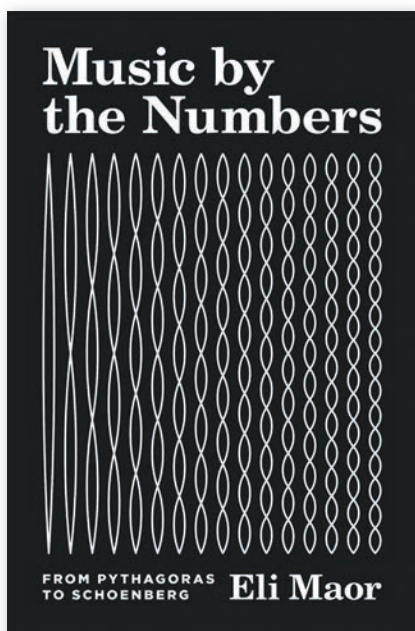Hardback 9780691176918 $27.95 | £22.00
E-book 9780691185026

The Discrete Charm of the Machine

A few short decades ago, we were informed by the smooth signals of analog television and radio; we communicated using our analog telephones; and we even computed with analog computers. Today our world is digital, built with zeros and ones. This book explains the varied physical and logical reasons behind this radical transformation. Steiglitz examines why our information technology became digital, and challenges us to think about where its future trajectory may lead.

KEN STEIGLITZ is professor emeritus of computer science and senior scholar at Princeton University. His books include *Combinatorial Optimization*, *A Digital Signal Processing Primer*, and *Snipers, Shills, and Sharks* (Princeton).

February 2019. 256 pages. 40 b/w illus. 6 x 9.
Hardback 9780691179438 $27.95 | £22.00
E-book 9780691184173

Music by the Numbers

Music is filled with mathematical elements. Yet Eli Maor argues that music has influenced math at least as much as math has influenced music. Starting with Pythagoras, proceeding through the work of Schoenberg, and ending with contemporary string theory, *Music by the Numbers* tells a fascinating story of composers, scientists, inventors, and eccentrics who played a role in the age-old relationship between music, mathematics, and the sciences, especially physics and astronomy. Weaving these compelling historical episodes with Maor's personal reflections, this book will delight anyone who loves mathematics and music.

ELI MAOR is a former professor of the history of mathematics at Loyola University Chicago. He is the author of seven previous books, including the internationally acclaimed *To Infinity and Beyond*, *e: The Story of a Number*, *Trigonometric Delights*, and *The Pythagorean Theorem: A 4,000-Year History* (all Princeton).

2018. 176 pages. 43 b/w illus. 5 ½ x 8 ½.
Hardback 9780691176901 $24.95 | £20.00
E-book 9781400889891
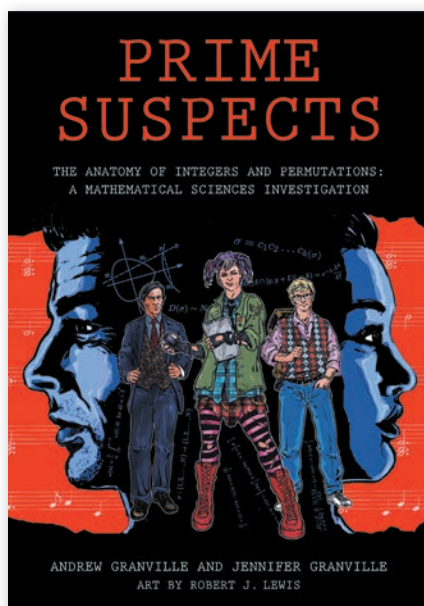
"One of the most creative ways to present advanced mathematical ideas that I have seen."
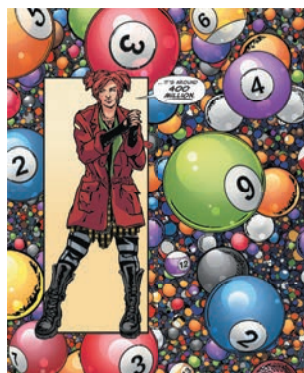—Terence Tao, University of California, Los Angeles

Prime Suspects

An outrageous graphic novel that investigates key concepts in mathematics
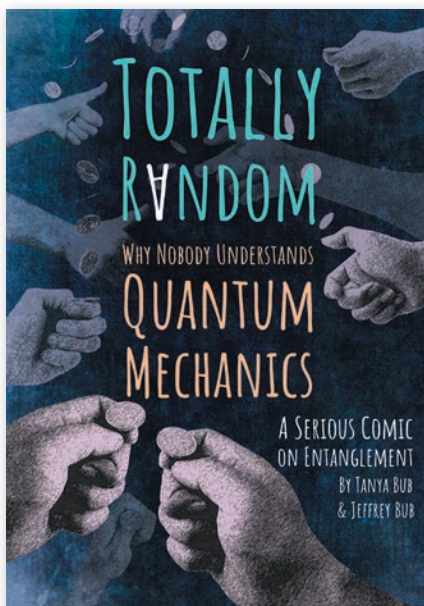
Prime Suspects is a graphic novel that takes you on a voyage of forensic discovery, exploring some of the most fundamental ideas in mathematics. Travel with Detective von Neumann as he leaves no clue unturned, from shepherds' huts in the Pyrenees to secret societies in the cafés of Paris, from the hidden codes in the music of the stones to the grisly discoveries in Finite Fields. Tremble at the ferocity of the believers in deep and rigid abstraction. Feel the pain as you work with our young heroine, Emmy Germain, as she blazes a trail for women in mathematical research and learns from Professor Gauss, the greatest forensic detective of them all.

Beautifully drawn and wittily and exquisitely detailed, *Prime Suspects* is unique, astonishing, and outrageous—a once-in-a-lifetime opportunity to experience mathematics like never before.

ANDREW GRANVILLE is the Canada Research Chair in Number Theory at the University of Montreal and professor of mathematics at University College London. **JENNIFER GRANVILLE** is an award-winning producer, screenwriter, and director, and the coauthor of *The Casting Handbook: For Film and Theatre Makers*.

Totally Random

Totally Random is a comic for the serious reader who wants to really understand the central mystery of quantum mechanics—entanglement. This graphic experiential narrative unpacks the curious correlation between entangled particles to deliver a glimpse of a world that is not what it seems. A fresh, subversive, and humorous look at our quantum world, it delivers a real understanding of entanglement that will change the way you think about the nature of physical reality.

TANYA BUB is founder of 48th Ave Productions, a web development company. **JEFFREY BUB** is Distinguished University Professor in the Department of Philosophy and the Institute for Physical Science and Technology at the University of Maryland, where he is also a fellow of the Joint Center for Quantum Information and Computer Science.

2018. 272 pages. 254 b/w illus. 6 ½ x 10.
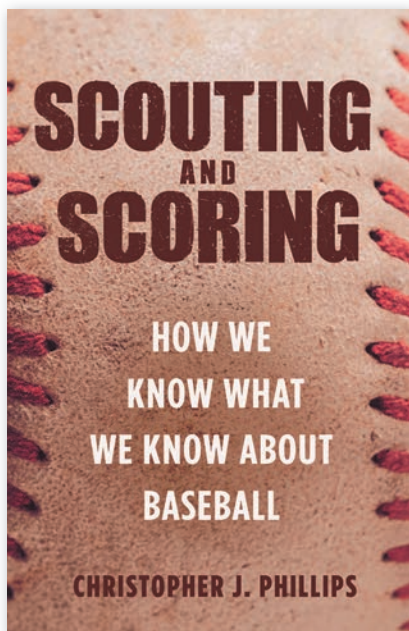Paperback 9780691176956 $22.95 | £17.99
E-book 9781400890392

The Best Writing on Mathematics 2018

This annual anthology brings together the year's finest mathematics writing from around the world. Featuring promising new voices alongside some of the foremost names in the field, this volume makes available to a wide audience many pieces not easily found anywhere else—and you don't need to be a mathematician to enjoy them. The essays delve into the history, philosophy, teaching, and everyday aspects of math, taking readers behind the scenes of today's hottest mathematical debates.

MIRCEA PITICI teaches advanced calculus at Syracuse University. He has a PhD in mathematics education from Cornell University and is working on a master's degree in library and information science at Syracuse's iSchool. He has edited *The Best Writing on Mathematics* since 2010.

2018. 272 pages. 25 color + 57 b/w illus. 2 tables. 5 ½ x 8 ½.
Paperback 9780691182766 $24.95 | £20.00
E-book 9780691188720

The Best Writing on Mathematics 2017
Paperback 9780691178639 $24.95 | £20.00
E-book 9781400888559

Scouting and Scoring

Scouting and scoring are considered fundamentally different ways of ascertaining value in baseball. Scouting seems to rely on experience and intuition, scoring on performance metrics and statistics. In *Scouting and Scoring*, Christopher Phillips rejects these simplistic divisions. He shows how both scouts and scorers rely on numbers, bureaucracy, trust, and human labor in order to make sound judgments about the value of baseball players. A unique consideration of the role of quantitative measurement and human judgment, *Scouting and Scoring* provides an entirely fresh understanding of baseball by showing what the sport reveals about reliable knowledge in the modern world.

CHRISTOPHER J. PHILLIPS is assistant professor of history at Carnegie Mellon University. He is the author of *The New Math: A Political History*.

March 2019. 312 pages. 15 b/w illus. 5 ½ x 8 ½.
Hardback 9780691180212 $29.95 | £24.00
E-book 9780691188980

The Tyranny of Metrics

Today, organizations of all kinds are ruled by the belief that the path to success is quantifying human performance, publicizing the results, and dividing up the rewards based on the numbers. But in our zeal to instill the evaluation process with scientific rigor, we've gone from measuring performance to fixating on measuring itself. The result is a tyranny of metrics that threatens the quality of our lives and most important institutions. In this timely and powerful book, Jerry Muller uncovers the damage our obsession with metrics is causing—and shows how we can begin to fix the problem. This an essential corrective to a rarely questioned trend that increasingly affects us all.

JERRY Z. MULLER is the author of many books. He is professor of history at the Catholic University of America in Washington, D.C.

April 2019. 240 pages. 5 x 8.
Paperback 9780691191911 $17.95 | £13.99
E-book 9780691191263

On the Future

Humanity has reached a critical moment. Our world is unsettled and rapidly changing, and we face existential risks over the next century. Yet our approach to the future is characterized by short-term thinking, polarizing debates, alarmist rhetoric, and pessimism. In this short, exhilarating book, Martin Rees argues that humanity's prospects depend on our taking a very different approach to planning for tomorrow. The future of humanity is bound to the future of science and hinges on how successfully we harness technological advances to address our challenges.

MARTIN REES is Astronomer Royal, and has been Master of Trinity College and Director of the Institute of Astronomy at Cambridge University. As a member of the UK's House of Lords and former President of the Royal Society, he is much involved in international science and issues of technological risk.

2018. 272 pages. 5 x 7 ½.
Hardback 9780691180441 $18.95 | £14.99
E-book 9780691184401   Audiobook 9780691192994

The Secret Life of Science

We take the advance of science as given. But how does science really work? Is it truly as healthy as we tend to think? How does the system itself shape what scientists do? *The Secret Life of Science* takes a clear-eyed and provocative look at the current state of global science, shedding light on a cutthroat and tightly tensioned enterprise that even scientists themselves often don't fully understand. A dispatch from the front lines of modern science, *The Secret Life of Science* explains why this hypercompetitive environment is stifling the diversity of research and the resiliency of science itself, and why new ideas are needed to ensure that the scientific enterprise remains healthy and vibrant.

JEREMY J. BAUMBERG is professor of nanotechnology and photonics in the Cavendish Laboratory at the University of Cambridge. He is the coauthor of *Microcavities*, and his work has been featured in such publications as *Nature*, *New Scientist*, and *Wired*.

2018. 248 pages. 41 b/w illus. 6 x 9.
Hardback 9780691174358 $29.95 | £24.00
E-book 9781400889303

On Gravity

Of the four fundamental forces of nature, gravity might be the least understood. In *On Gravity*, physicist A. Zee combines profound depth with incisive accessibility to take us on an original and compelling tour of Einstein's general theory of relativity. Concise, precise, and infused with Zee's signature warmth and freshness of style, this book opens a unique pathway to comprehending relativity and gaining deep insight into gravity, spacetime, and the workings of the universe.

A. ZEE is professor of physics at the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara. His many books include *Einstein Gravity in a Nutshell*, *Quantum Field Theory in a Nutshell*, and *Fearful Symmetry* (all Princeton).
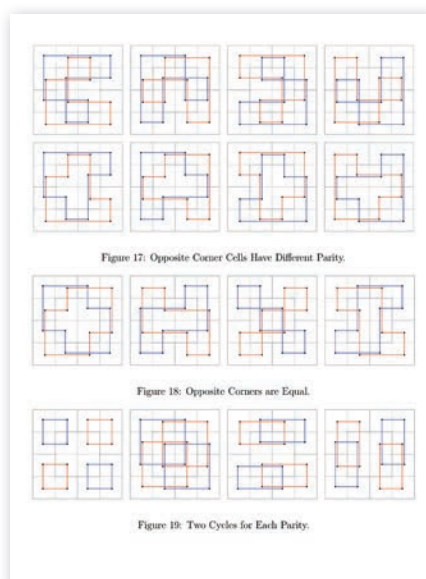
2018. 192 pages. 26 b/w illus. 5 ½ x 8 ½.
Hardback 9780691174389 $19.95 | £14.99
E-book 9781400890309

The Mathematics of Various Entertaining Subjects, Volume 3

The history of mathematics is filled with major breakthroughs resulting from solutions to recreational problems. Yet research in recreational mathematics has often been neglected. Here is a brand-new compilation of fascinating problems and solutions in recreational mathematics.

JENNIFER BEINEKE is professor of mathematics at Western New England University. **JASON ROSENHOUSE** is professor of mathematics at James Madison University.

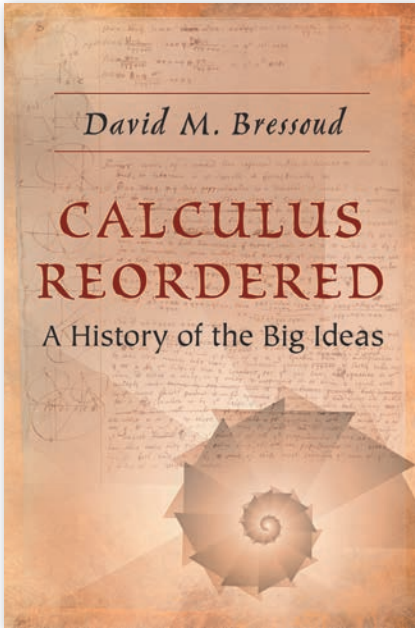August 2019. 408 pages. 71 color + 77 b/w illus. 47 tables. 6 x 9.
Paperback 9780691182582 $45.00 | £35.00
Hardback 9780691182575 $125.00 | £97.00
E-book 9780691194417

The Mathematics of Various Entertaining Subjects, Volume 1
Paperback 9780691183473 $39.95 | £30.00
E-book 9781400881338

The Mathematics of Various Entertaining Subjects, Volume 2
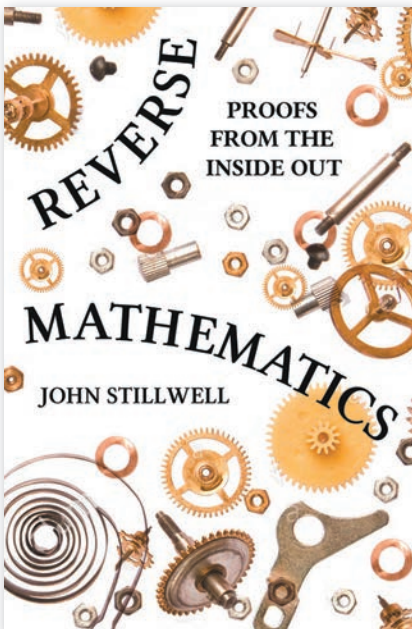Paperback 9780691192260 $59.95 | £47.00
E-book 9781400889136

"Beautifully and accessibly written.... [Bressoud's] account brings to life a story not of a small number of isolated geniuses, as is usually told, but rather a wonderful march forward, pursued by a great many individuals on multiple continents."
—Keith Devlin, author of *The Man of Numbers* and *Finding Fibonacci*

Calculus Reordered

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 argues that a pedagogy informed by the historical development of calculus presents a sounder way for students to learn this fascinating area of mathematics. Exploring the motivations behind calculus's discovery, *Calculus Reordered* highlights how this essential tool of mathematics came to be.

DAVID M. BRESSOUD is DeWitt Wallace Professor of Mathematics at Macalester College and Director of the Conference Board of the Mathematical Sciences. His many books include *Second Year Calculus* and *A Radical Approach to Lebesgue's Theory of Integration*.

July 2019. 272 pages. 74 b/w illus. 1 table. 6 x 9.
Hardback 9780691181318 $29.95 | £24.00
E-book 9780691189161

"Reverse mathematics is the mathematical logician's version of zoology or botany, a classification of mathematical theorems in terms of the strength of the axioms needed to prove them. Stillwell … does a fine job of making the whole endeavor accessible to a general mathematical audience."
—Jeremy Avigad, Carnegie Mellon University

Reverse Mathematics

Reverse mathematics is a new field that answers some old questions: which axioms are needed to prove a given theorem? Only in the last two hundred years have some of these questions been answered, and only in the last forty years has a systematic approach been developed. John Stillwell gives a representative view of this field, emphasizing basic analysis and giving a novel approach to logic. This book will engage advanced undergraduates and all mathematicians interested in the foundations of mathematics.

JOHN STILLWELL is professor of mathematics at the University of San Francisco and an affiliate of the School of Mathematical Sciences at Monash University, Australia. His many books include *Elements of Mathematics: From Euclid to Gödel* (Princeton).

2018. 200 pages. 35 b/w illus. 6 x 9.
Hardback 9780691177175 $24.95 | £20.00
E-book 9781400889037

"A cheerful pursuit to rediscover the hero of 13th-century European mathematics.... [E]ntertaining and surprising."—Publishers Weekly

Finding Fibonacci

In 2000, Keith Devlin set out to research the medieval mathematician Leonardo of Pisa, popularly known as Fibonacci. Fibonacci's greatest contribution was as an expositor of mathematical ideas at a level ordinary people could understand. Yet it was not until the 1960s that his true achievements were finally recognized. Fibonacci vanished from the pages of history. This is Devlin's search to find him.

KEITH DEVLIN is a mathematician at Stanford University and cofounder and president of BrainQuake. He is "the Math Guy" on National Public Radio.

July 2019. 256 pages. 23 b/w illus. 5 ½ x 8 ½.
Paperback 9780691192307 $17.95 | £13.99   E-book 9781400885534
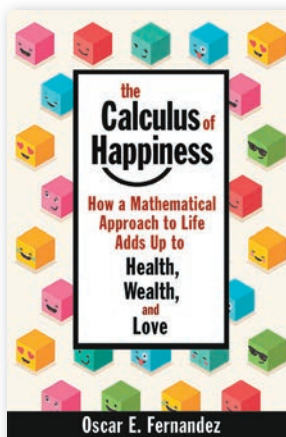
"Readers are sure to get a sense of how content from algebra and precalculus can help inform us about important decisions that are almost universally relevant."—Jason M. Graham, MAA Reviews

The Calculus of Happiness

In this book, Oscar Fernandez shows us that math yields powerful insights into health, wealth, and love. Relying on only high school-level math (precalculus with a dash of calculus), Fernandez uses everyday experiences to provide context for his mathematical insights and guides us through surprising results.

OSCAR E. FERNANDEZ is associate professor of mathematics at Wellesley College and the author of *Everyday Calculus* and *Calculus Simplified* (both Princeton).

July 2019. 176 pages. 14 b/w illus. 14 tables. 6 x 9.
Paperback 9780691192314 $16.95 | £13.99   E-book 9781400884810
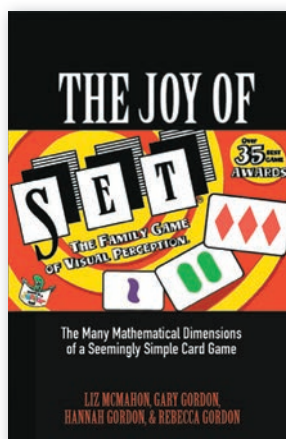
"The book shows how budding interest in mathematics can be fostered and developed."—Alexander Bogomolny, Cut the Knot

The Joy of SET

This book takes readers on a fascinating journey into the seemingly simple card game SET and reveals its surprisingly deep and diverse mathematical dimensions. No mathematical background is necessary to enjoy this book—all you need is a sense of curiosity and adventure!

LIZ MCMAHON and **GARY GORDON** are professors of mathematics at Lafayette College. **HANNAH GORDON** is a SET Grand Master and currently works at the New York City Department of Education. **REBECCA GORDON** teaches mathematics at Newark Academy.

July 2019. 320 pages. 164 color + 9 b/w illus. 43 tables. 6 x 9.
Paperback 9780691192321 $19.95 | £14.99   E-book 9781400884483

"Bauer proves an able and entertaining guide to the world of real-life ciphers, codes, and encryption."—Peter Dabbene, *Foreword Reviews*

Unsolved!

In this lively and entertaining book, Craig Bauer examines vexing ciphers yet to be cracked. Some may reveal the identity of a spy or serial killer, provide the location of buried treasure, or expose a secret society—while others may be elaborate hoaxes. Laying out the evidence surrounding each cipher, he describes the efforts to decipher it, and invites readers to try their hand at puzzles that have stymied so many others.

CRAIG P. BAUER is professor of mathematics at York College of Pennsylvania. He is editor in chief of the journal *Cryptologia* and has served as a scholar in residence at the NSA's Center for Cryptologic History.

June 2019. 640 pages. 230 b/w illus. 17 tables. 6 x 9.
Paperback 9780691192291 $22.95 | £17.99   E-book 9781400884797
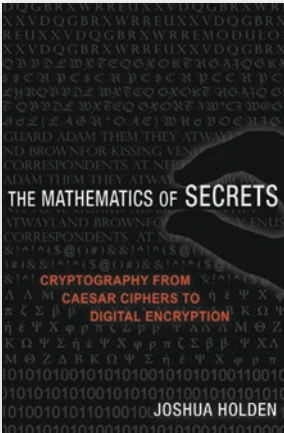
"This is a marvelous way of illustrating the use of simple mathematics in an important application that has triggered the wit of the designers and the ingenuity of the attackers since antiquity."
—Adhemar Bultheel, *European Mathematical Society*

The Mathematics of Secrets

The Mathematics of Secrets takes readers on a fascinating tour of the mathematics behind cryptography—the science of sending secret messages. Using a wide range of historical anecdotes and real-world examples, Joshua Holden shows how mathematical principles underpin the ways that different codes and ciphers work.

JOSHUA HOLDEN is professor of mathematics at the Rose-Hulman Institute of Technology.

2018. 392 pages. 97 b/w illus. 16 tables. 6 x 9.
Paperback 9780691183312 $18.95 | £14.99   E-book 9780691184555
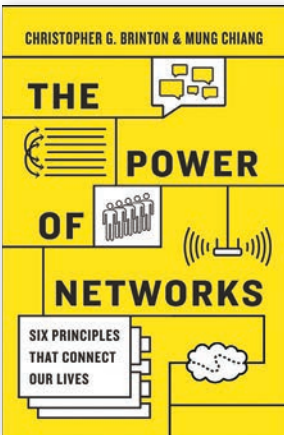
"[Offers] an open and accessible pathway through the complexity of network design and deployment…. [A] course in digital citizenship."
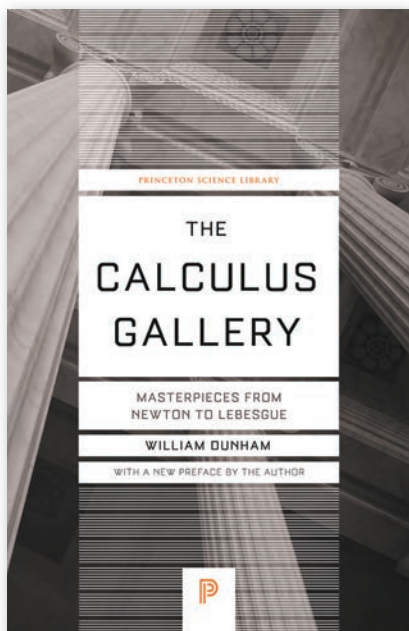—John Gilbey, *Times Higher Education*

The Power of Networks

Using no more math than simple addition and multiplication, this book provides a smart and accessible introduction to the handful of big ideas that drive the computer networks we use every day.

CHRISTOPHER G. BRINTON is the Head of Advanced Research at Zoomi Inc. and lecturer in electrical engineering at Princeton University. **MUNG CHIANG** is the John A. Edwardson Dean of the College of Engineering at Purdue University.

2018. 328 pages. 223 b/w illus. 12 tables. 6 x 9.
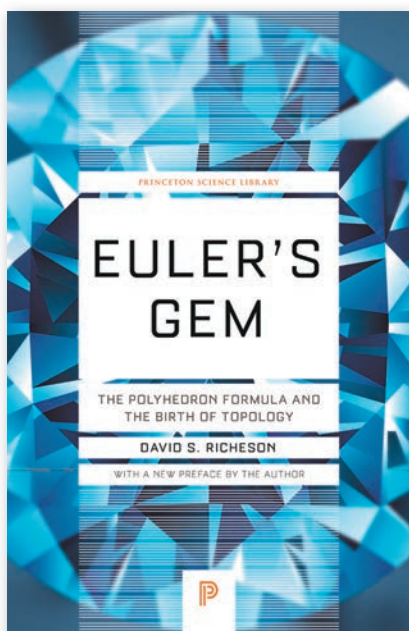Paperback 9780691183305 $24.95 | £20.00   E-book 9781400884070

"Clear and accessible.... Mathematicians, scientists, and historians alike can learn much that is interesting, much that is mathematically significant, and a good deal that is both."—Judith V. Grabiner, *Science*

The Calculus Gallery

More than three centuries after its creation, calculus remains a dazzling intellectual achievement and the gateway to higher mathematics. Dunham charts its growth and development by sampling from the work of some of its foremost practitioners. Now with a new preface by the author, this book documents the evolution of calculus—a story of genius triumphing over some of the toughest, subtlest problems imaginable.

WILLIAM DUNHAM is a Research Associate in Mathematics at Bryn Mawr College. He is the author of *Journey Through Genius: The Great Theorems of Mathematics*, *The Mathematical Universe*, and *Euler: The Master of Us All*, and is a co-editor (along with Jerry Alexanderson and Don Albers) of *The G.H. Hardy Reader*. He received the Mathematical Association of America's Beckenbach Prize for expository writing.

2018. 256 pages. 63 b/w illus. 5 ½ x 8 ½.
Paperback 9780691182858 $19.95 | £14.99
E-book 9780691184548

"Does an outstanding job of explaining serious mathematics to a general audience.... The book succeeds at showing the reader a lot of attractive mathematics with a well-chosen level of technical detail."
—Jeremy L. Martin, *Notices of the AMS*

Euler's Gem

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. 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.

DAVID S. RICHESON is professor of mathematics at Dickinson College.

July 2019. 336 pages. 221 b/w illus. 8 tables. 5 ½ x 8 ½.
Paperback 9780691191379 $19.95 | £14.99
E-book 9780691191997

Success through Failure

Design pervades our lives. But what makes a great design? In this compelling and wide-ranging look at the essence of invention, Henry Petroski argues that, time and again, we have built success on the back of failure—not through easy imitation of success. This book shows us that making something better—by carefully anticipating and thus averting failure—is what invention and design are all about.

HENRY PETROSKI is the Aleksandar S. Vesic Professor of Civil Engineering and professor of history at Duke University.

2018. 256 pages. 15 b/w illus. 5 ½ x 8 ½.
Paperback 9780691180991 $19.95 | £14.99   E-book 9781400889686
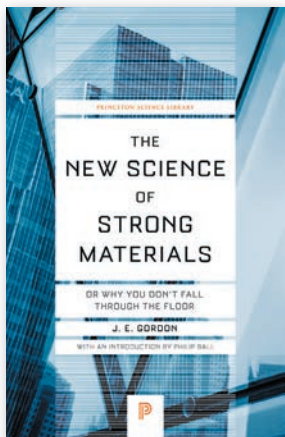
The New Science of Strong Materials

J. E. Gordon's classic introduction focuses on so-called strong materials such as metals, wood, ceramics, glass, and bone, explaining in accessible terms the physical and chemical basis for their inherent structural qualities. A new introduction by science writer Philip Ball describes Gordon's career and contributions to materials research, while also discussing how the field has evolved.

J. E. GORDON (1913–98) was a founder of materials science and biomechanics. He was the author of *The Science of Structures and Materials*.

2018. 328 pages. 65 b/w illus. 6 tables. 5 ½ x 8 ½.
Paperback 9780691180984 $19.95 | £14.99
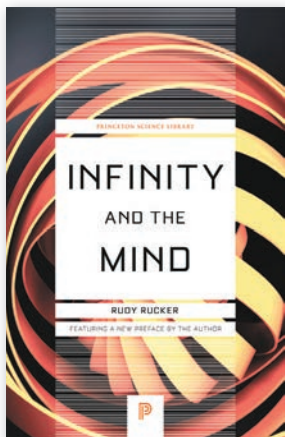
Infinity and the Mind

Using cartoons, puzzles, and quotations to enliven his text, 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. By closely examining the paradoxes that arise, we gain profound insights into the human mind, its powers, and its limitations.

RUDY RUCKER is a mathematician, computer scientist, author, and one of the founders of the cyberpunk literary movement.

July 2019. 288 pages. 110 b/w illus. 5 ½ x 8 ½.
Paperback 9780691191386 $17.95 | £13.99   E-book 9780691191256

"Conveys a deep understanding of … core concepts of dynamical systems to a much larger audience than was previously possible."
—Van Savage, University of California, Los Angeles

Chaos and Dynamical Systems

This book presents an accessible, clear introduction to dynamical systems and chaos theory. While the rules governing dynamical systems are well-specified and simple, the behavior of many dynamical systems is remarkably complex. Using little math beyond basic algebra, Feldman gives readers a grounded, concrete, and concise overview.

DAVID P. FELDMAN is professor of physics and mathematics at the College of the Atlantic.

August 2019. 280 pages. 84 b/w illus. 5 ½ x 8 ½.
Paperback 9780691161525 $35.00 | £27.00   E-book 9780691189390
Primers in Complex Systems
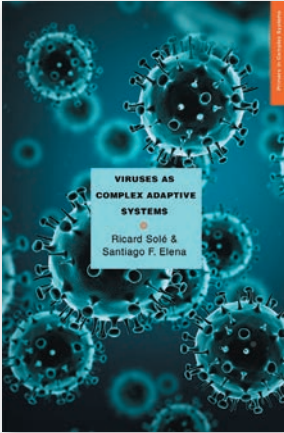
"Stimulating and timely.… Clearly structured and easy to read."
—Fernando García-Arenal, Universidad Politécnica de Madrid

Viruses as Complex Adaptive Systems

Viruses drive the evolution of our species and regulate ecosystems on a global scale. This book draws on complex systems theory to provide a fresh look at viral origins, populations, and evolution, and the coevolutionary dynamics of viruses and their hosts.

RICARD SOLÉ is research professor and head of the Complex Systems Lab at Pompeu Fabra University in Barcelona. **SANTIAGO F. ELENA** is professor and head of the Evolutionary Systems Virology Lab at the Spanish National Research Council (CSIC) in Valencia.

2018. 240 pages. 69 b/w illus. 5 ½ x 8 ½.
Paperback 9780691158846 $35.00 | £27.00   E-book 9780691185118
Primers in Complex Systems

"Shows that complex and simple contagion processes are different, and that these differences are important for understanding a wide class of diffusion outcomes."—Peter Bearman, Columbia University

How Behavior Spreads

Can the lessons learned from the viral diffusion of diseases be used to improve the spread of beneficial behaviors and innovations? Damon Centola examines how changes in societal behavior occur and the ways social networks can be used to influence how they propagate.

DAMON CENTOLA is an associate professor in the Annenberg School for Communication and the School of Engineering and Applied Sciences at the University of Pennsylvania.

2018. 312 pages. 53 b/w illus. 6 x 9.
Hardback 9780691175317 $35.00 | £27.00   E-book 9781400890095
Princeton Analytical Sociology Series
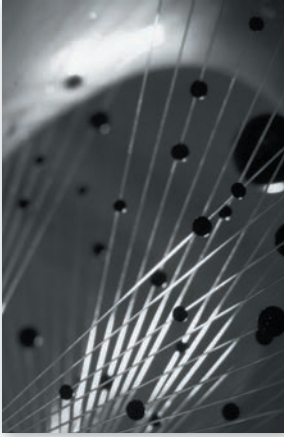
"Innovative, mathematically exact, and very well written. Garoche is a rare resource."—Eric Feron, Georgia Institute of Technology

Formal Verification of Control Systems Software

The verification of control systems software is critical to a host of technologies and industries, from aeronautics and medical technology to the cars we drive—the failure of controller software can cost people their lives. This authoritative and accessible book provides an indispensable introduction to the formal techniques for analyzing and verifying this important class of software.

PIERRE-LOÏC GAROCHE is senior research scientist at ONERA.

May 2019. 232 pages. 79 b/w illus. 6 x 9.
Hardback 9780691181301 $55.00 | £43.00   E-book 9780691189581
Princeton Series in Applied Mathematics
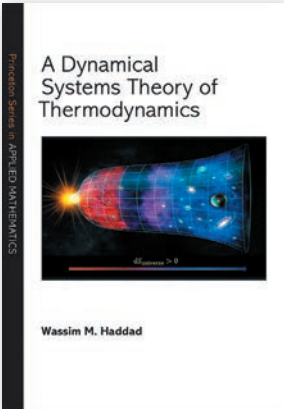
"A major contribution."—Frank Lewis, University of Texas, Arlington

A Dynamical Systems Theory of Thermodynamics

This book merges the two universalisms of thermodynamics and dynamical systems theory under a single compendium to develop a new and unique framework for dynamical thermodynamics.

WASSIM M. HADDAD is a professor in the School of Aerospace Engineering, the David Lewis Chair in Dynamical Systems and Control, and chair of the Flight Mechanics and Control Discipline, all at the Georgia Institute of Technology, where he also holds a joint professor appointment with the School of Electrical and Computer Engineering.

June 2019. 736 pages. 20 b/w illus. 7 x 10.
Hardback 9780691190143 $95.00 | £74.00   E-book 9780691192598
Princeton Series in Applied Mathematics
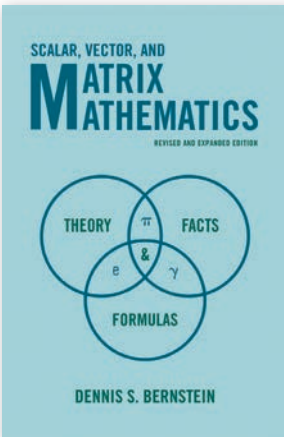
"If you have any questions about sets, graphs, and functions, derivatives and integrals, sequences and limits, and even geometry, you will almost certainly find an answer here."
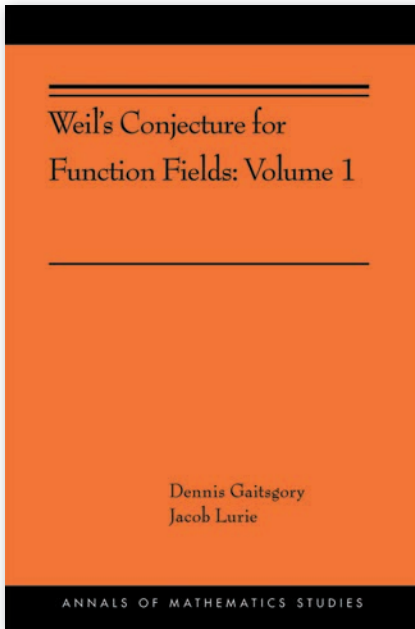—Götz Trenkler, Technical University of Dortmund, Germany

Scalar, Vector, and Matrix Mathematics

Since its initial publication, this book has become the essential reference for users of matrices in all branches of engineering, science, and applied mathematics. This revised and expanded edition is the most comprehensive, current, and easy-to-use book on the subject.

DENNIS S. BERNSTEIN is professor of aerospace engineering at the University of Michigan.

2018. 1600 pages. 2 b/w illus. 7 x 10.
Paperback 9780691176536 $99.50 | £77.00
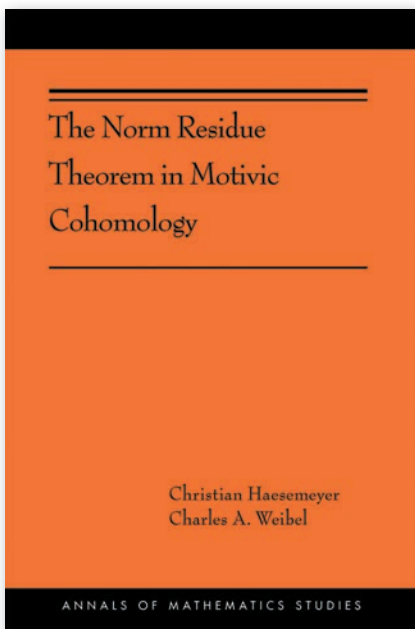Hardback 9780691151205 $185.00 | £143.00   E-book 9781400888252

Weil's Conjecture for Function Fields

In number theory, local-to-global principles describe the behavior of a global field K in terms of the behavior of various completions of K. This book looks at Weil's conjecture on the Tamagawa number of a semisimple algebraic group G over K. In the case where K is the function field of an algebraic curve X, this conjecture counts the number of G-bundles on X (global information) in terms of the reduction of G at the points of X (local information). This book gives a conceptual proof of Weil's conjecture, based on the geometry of the moduli stack of G-bundles. It introduces a theory of factorization homology in the setting ℓ-adic sheaves. The authors articulate a a product formula that expresses the cohomology of the moduli stack of G-bundles (a global object) as a tensor product of local factors, and show that this product formula implies Weil's conjecture. The proof of the product formula will appear in a sequel volume.

DENNIS GAITSGORY is professor of mathematics at Harvard University. **JACOB LURIE** is professor of mathematics at Harvard University.
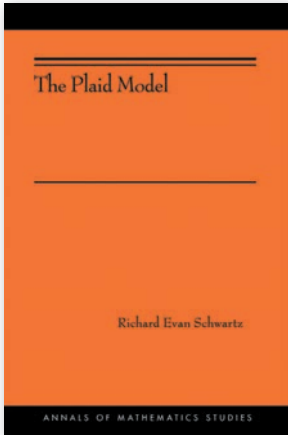
February 2019. 328 pages. 6 x 9.
Paperback 9780691182148 $75.00 | £58.00
Hardback 9780691182131 $165.00 | £127.00
E-book 9780691184432

The Norm Residue Theorem in Motivic Cohomology

This book presents the complete proof of the Bloch-Kato conjecture and several related conjectures of Beilinson and Lichtenbaum in algebraic geometry. Brought together here for the first time, these conjectures describe the structure of étale cohomology and its relation to motivic cohomology and Chow groups.

Comprehensive and self-contained, *The Norm Residue Theorem in Motivic Cohomology* unites various components of the proof that until now were scattered across many sources of varying accessibility, often with differing hypotheses, definitions, and language.

CHRISTIAN HAESEMEYER is professor in the School of Mathematics and Statistics at the University of Melbourne. **CHARLES A. WEIBEL** is Distinguished Professor of Mathematics at Rutgers University.

June 2019. 272 pages. 2 b/w illus. 6 x 9.
Hardback 9780691181820 $165.00 | £127.00
E-book 9780691189635

The Plaid Model

Outer billiards provides a toy model for planetary motion and exhibits intricate and mysterious behavior even for seemingly simple examples. It is a dynamical system in which a particle in the plane moves around the outside of a convex shape according to a scheme that is reminiscent of ordinary billiards. *The Plaid Model*, which is a self-contained sequel to Richard Schwartz's *Outer Billiards on Kites*, provides a combinatorial model for orbits of outer billiards on kites.

The book includes an extensive computer program that allows readers to explore the materials interactively and each theorem is accompanied by a computer demonstration.

RICHARD EVAN SCHWARTZ is the Chancellor's Professor of Mathematics at Brown University.

February 2019. 280 pages. 103 b/w illus. 6 x 9.
Paperback 9780691181387 $75.00 | £58.00
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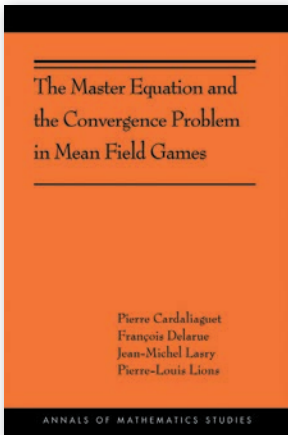
The Master Equation and the Convergence Problem in Mean Field Games

This book describes the latest advances in the theory of mean field games, which are optimal control problems with a continuum of players, each of them interacting with the whole statistical distribution of a population. While originating in economics, this theory now has applications in areas as diverse as mathematical finance, crowd phenomena, epidemiology, and cybersecurity.

This groundbreaking book presents two important new results in mean field games that contribute to a unified theoretical framework for this exciting and fast-developing area of mathematics.

PIERRE CARDALIAGUET, FRANÇOIS DELARUE, JEAN-MICHEL LASRY & PIERRE-LOUIS LIONS

August 2019. 192 pages. 6 x 9.
Paperback 9780691190716 $75.00 | £58.00
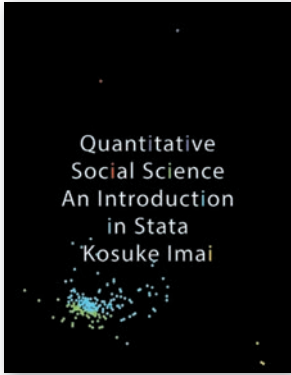Hardback 9780691190709 $165.00 | £127.00

Annals of Mathematics

Edited by Charles Fefferman, David Gabai, Nicholas M. Katz, Sergiu Klainerman, Peter Sarnak & Gang Tian
Associate Editors: Alexei Borodin, Etienne Ghys, Robert Guralnick, Christoper Hacon, William Minicozzi & Tamar Ziegler

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Praise for the previous edition: "Does what truly great introductions to a topic all do—it generates excitement."
—Kevin M. Quinn, University of California, Berkeley

Quantitative Social Science

This textbook is a practical introduction to data analysis and statistics written especially for undergraduates and beginning graduate students in the social sciences and allied fields. It engages directly with empirical analysis, showing students how to analyze data using the Stata statistical software and interpret the results to answer important questions about society and human behavior.

KOSUKE IMAI is Professor of Government and of Statistics at Harvard University.

August 2019. 432 pages. 14 color + 86 b/w illus. 7 x 10.
Paperback 9780691191096 $49.95 | £40.00
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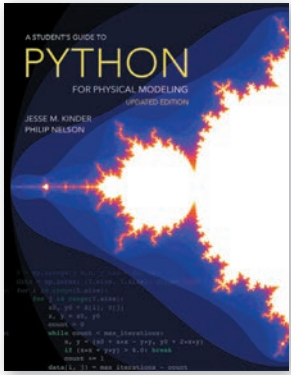
Praise for the previous edition: "Friendly and succinct, yet surprisingly comprehensive."—Vinothan N. Manoharan, Harvard University

A Student's Guide to Python for Physical Modeling

This updated edition aims to help students with no prior programming experience teach themselves enough of the Python programming language to get started with physical modeling. Readers will learn how to use an open-source Python programming environment for importing, exporting, and visualizing data; numerical analysis; and simulation.

JESSE M. KINDER is assistant professor of physics at the Oregon Institute of Technology. **PHILIP NELSON** is professor of physics at the University of Pennsylvania.

2018. 168 pages. 5 color illus. 8 x 10.
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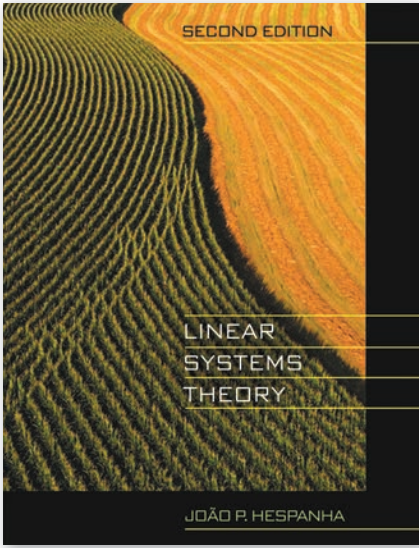Hardback 9780691180564 $75.00 | £58.00   E-book 9781400889426
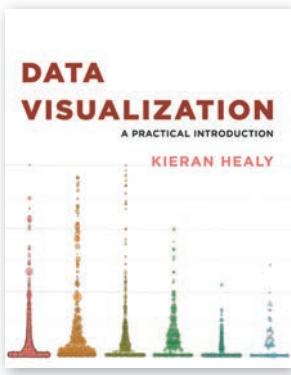
"A brilliant book that not only teaches the reader how to visualize data but also carefully considers why data visualization is essential for good social science…. [E]asily accessible for students at any level."
—Becky Pettit, University of Texas at Austin

Data Visualization

This book provides students and researchers a hands-on introduction to the principles and practice of data visualization. It explains what makes some graphs succeed while others fail, how to make high-quality figures from data using powerful and reproducible methods, and how to think about data visualization in an honest and effective way.

KIERAN HEALY is associate professor of sociology at Duke University.

2018. 296 pages. 185 color illus. 8 x 10.
Paperback 9780691181622 $40.00 | £30.00
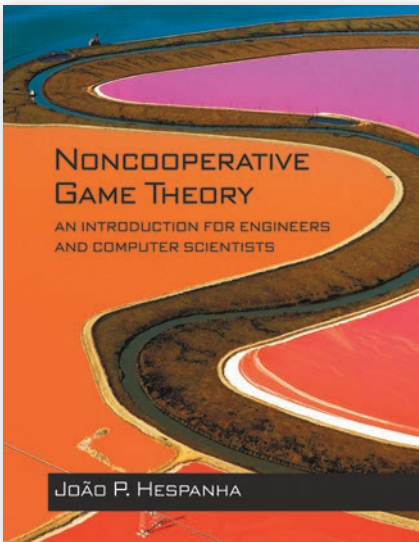Hardback 9780691181615 $99.95 | £77.00   E-book 9780691185064

Linear Systems Theory

Linear systems theory is the cornerstone of control theory and a well-established discipline that focuses on linear differential equations from the perspective of control and estimation. This updated second edition covers key topics in a unique lecture-style format, making the book easy to use for instructors and students. The textbook presents only the most essential mathematical derivations and places comments, discussion, and terminology in sidebars so that readers can follow the core material easily and without distraction.

JOÃO P. HESPANHA is professor of electrical engineering in the Center for Control, Dynamical Systems and Computation at the University of California, Santa Barbara.

2018. 352 pages. 52 b/w illus. 8 x 10.
Hardback 9780691179575 $85.00 | £66.00
E-book 9781400890088

Noncooperative Game Theory

Noncooperative Game Theory is aimed at students interested in using game theory as a design methodology for solving problems in engineering and computer science. João Hespanha shows that such design challenges can be analyzed through game theoretical perspectives that help to pinpoint each problem's essence: Who are the players? What are their goals? Will the solution to "the game" solve the original design problem? Using the fundamentals of game theory, Hespanha explores these issues and more.

Noncooperative Game Theory offers students a fresh way of approaching engineering and computer science applications.

JOÃO P. HESPANHA

2017. 248 pages. 8 x 10.
Hardback 9780691175218 $65.00 | £50.00
E-book 9781400885442

Figure 1.4 Each pigeonhole in a 9×9 array has one pigeon. All simultaneously move to another pigeonhole that is immediately above, below, to the left, or to the right of its current hole. Must some pigeonhole wind up with two pigeons?

March 2019. 408 pages. 116 color + 77 b/w illus. 19 tables. 8 x 10.
Hardback 9780691179292 $75.00 | £58.00
E-book 9780691190617

"Lewis and Zax give us a nice introduction to the essential concepts of discrete mathematics that any computer scientist should know. Their book presents a rigorous treatment of the important results, but it also goes beyond that by discussing the big picture behind the key ideas.… [I]deal as a textbook or as supplementary reading."
—Saúl A. Blanco, Indiana University

Essential Discrete Mathematics for Computer Scientists

Discrete mathematics is the basis of much of computer science, from algorithms and automata theory to combinatorics and graph theory. This textbook covers the discrete mathematics that every computer science student needs to learn. Guiding students through short chapters that discuss one major topic each, this flexible book can be tailored to any teaching approach.

HARRY LEWIS is Gordon McKay Professor of Computer Science and former dean of Harvard College at Harvard University. **RACHEL ZAX** is a software engineer at Google.
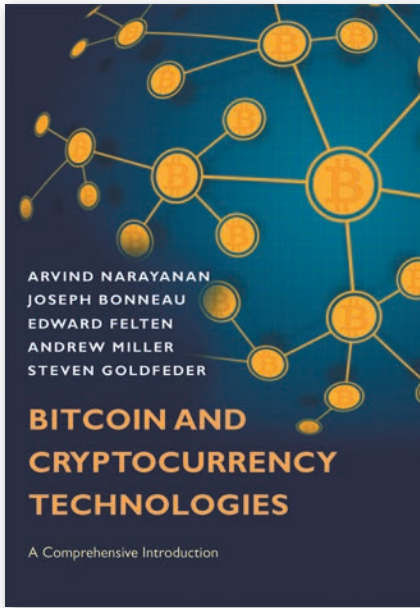
2016. 336 pages. 97 b/w illus. 7 tables. 7 x 10.
Hardback 9780691171692 $49.50 | £40.00
E-book 9781400884155
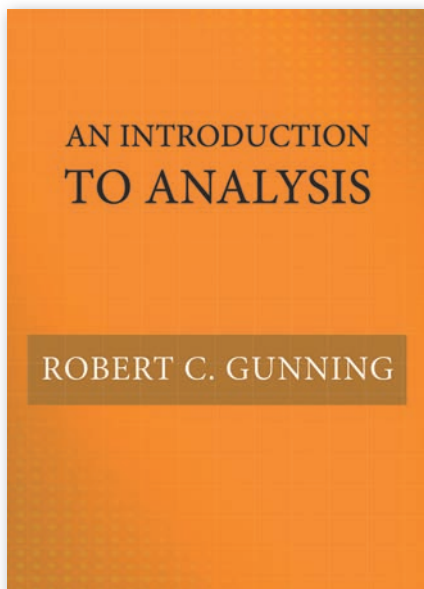Honorable Mention for the 2017 PROSE Award in Computing and Information Sciences, Association of American Publishers

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—Campbell R. Harvey, Duke University

Bitcoin and Cryptocurrency Technologies

This book provides a comprehensive introduction to the revolutionary yet often misunderstood new technologies of digital currency. Whether you are a student, software developer, tech entrepreneur, or researcher in computer science, this authoritative and self-contained book tells you everything you need to know about the new global money for the Internet age.

The book begins by tracing the history and development of Bitcoin and cryptocurrencies, and then gives the conceptual and practical foundations you need to engineer secure software that interacts with the Bitcoin network as well as to integrate ideas from Bitcoin into your own projects.

ARVIND NARAYANAN, JOSEPH BONNEAU, EDWARD FELTEN, ANDREW MILLER & STEVEN GOLDFEDER

"The ideal textbook to cover the foundations of mathematics.... This is one of the best books at the undergraduate level that I've ever read."
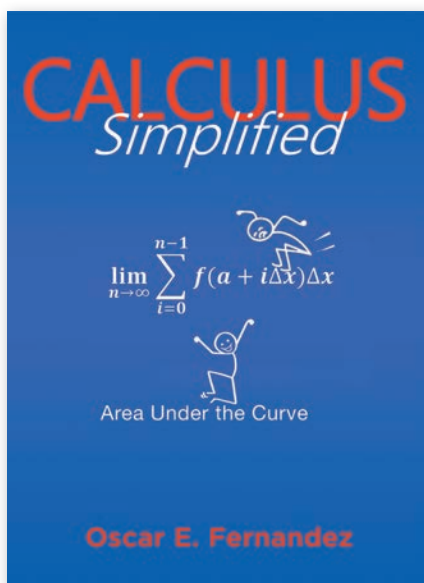—Jonathan Shock, *Mathemafrica*

An Introduction to Analysis

This is an essential primer on basic results in algebra, topology, and calculus for undergraduate students considering advanced degrees in mathematics. Ideal for use in a one-year course, this unique textbook also introduces students to rigorous proofs and formal mathematical writing—skills they need to excel.

Proven in the classroom, *An Introduction to Analysis* is the first textbook to bring these topics together in one easy-to-use and comprehensive volume.

ROBERT C. GUNNING is professor of mathematics at Princeton University. His books include *Lectures on Riemann Surfaces* and *Lectures on Complex Analytic Varieties* (both Princeton).

2018. 384 pages. 25 b/w illus. 7 x 10.
Hardback 9780691178790 $75.00 | £58.00
E-book 9781400889419

"This reader-friendly book is specifically designed for first-year calculus students. Fernandez writes in a welcoming style and the text is neither repetitive nor jargon-laden. With a strong presentation, well-chosen examples, and useful exercises, he does a marvelous job distilling the subject down to the essentials."
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Calculus Simplified

Calculus is a beautiful subject that most of us learn from calculus professors, textbooks, or supplementary texts. Each of these resources has strengths but also weaknesses. 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. *Calculus Simplified* gives you the freedom to choose your calculus experience, and the right support to help you conquer the subject with confidence.

OSCAR E. FERNANDEZ is associate professor of mathematics at Wellesley College. He is the author of *Everyday Calculus* and *The Calculus of Happiness* (both Princeton).

May 2019. 256 pages. 121 b/w illus. 7 x 10.
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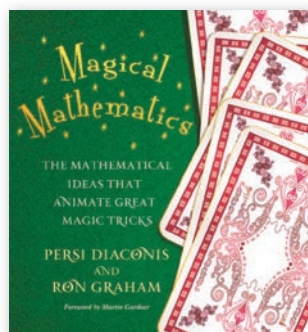E-book 9781400844975
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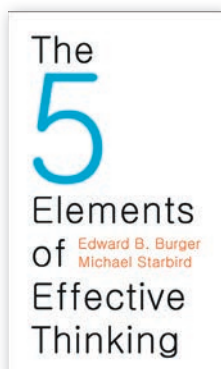Hardback 9780691174167 $27.95 | £22.00
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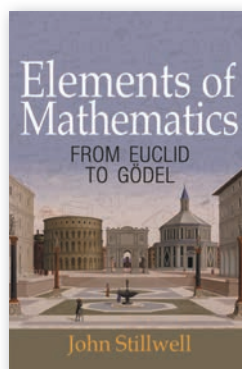Persi Diaconis & Ron Graham
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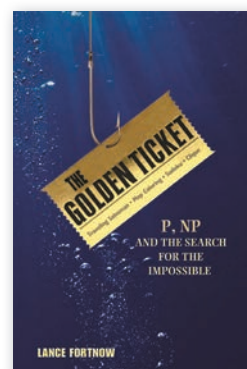
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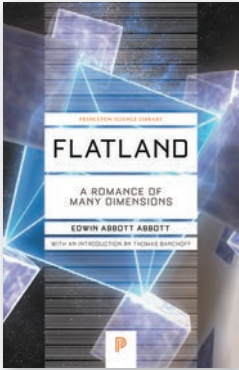E-book 9781400884803
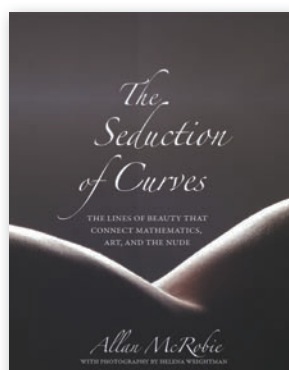
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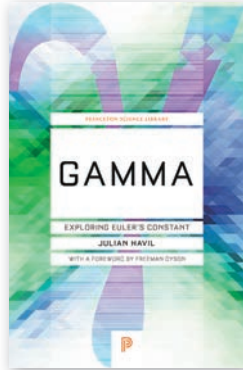Hardback 9780691175331 $35.00 | £27.00

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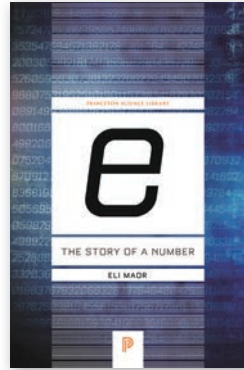Lynn Gamwell
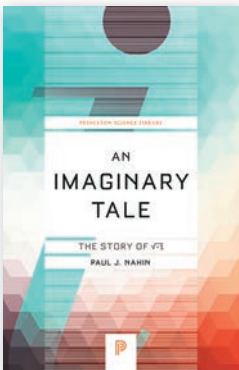Hardback 9780691165288 $49.50 | £40.00

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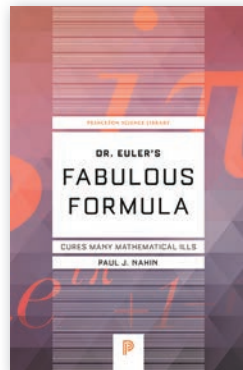Paperback 9780691165554 $12.95 | £9.99
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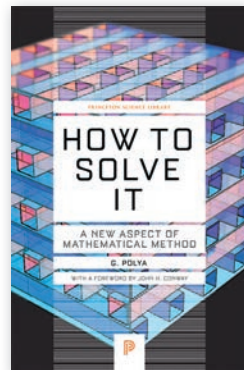E-book 9781400832538

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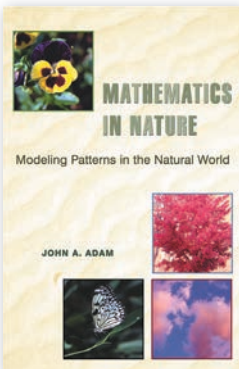
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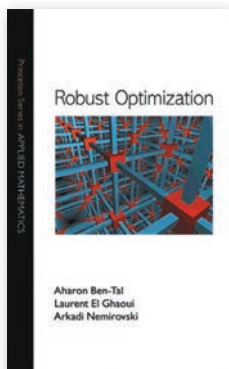E-book 9781400841011
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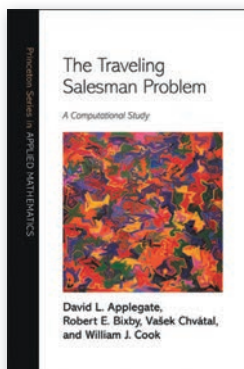Paperback 9780691129495 $19.95 | £14.99
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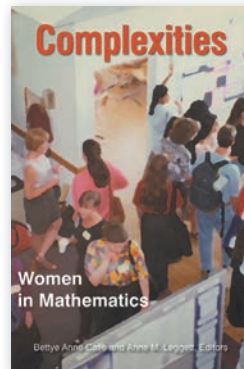
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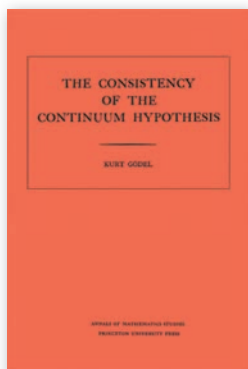E-book 9781400880164

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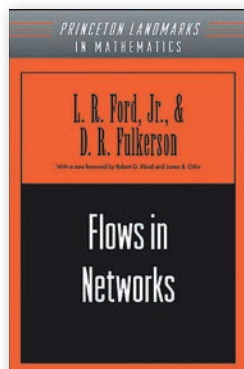E-book 9781400831050

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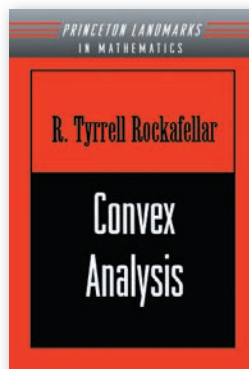
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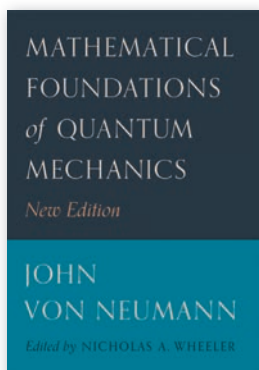
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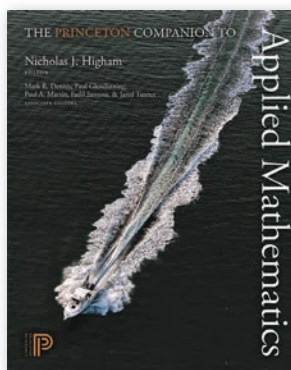
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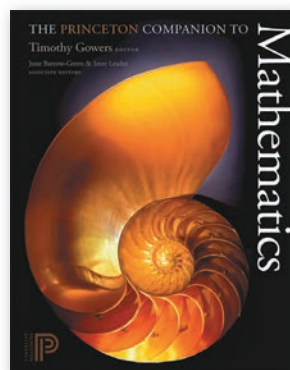
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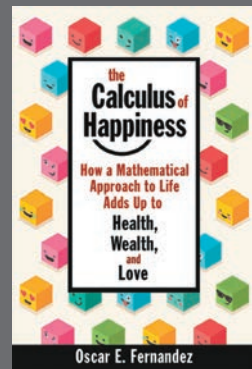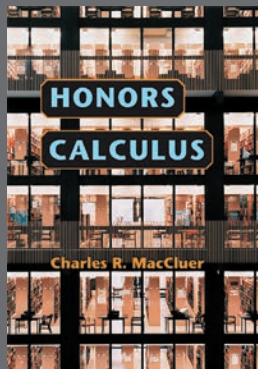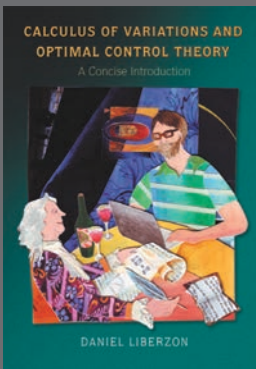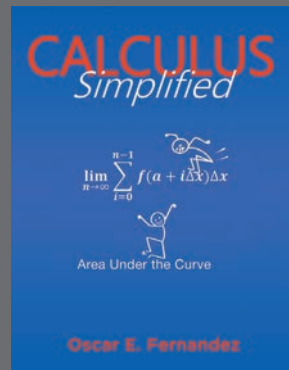| Qty ISBN	Author: Title	Page	Price	UK Price	Qty ISBN	Author: Title	Page	Price	UK Price
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