

# MAA eBooks

## 2015 Catalog



**MAA PRESS**

Mathematical Association of America

# TABLE OF CONTENTS

About our eBooks.....	4	History.....	33
New.....	5	Popular & Expository.....	35
Algebra.....	26	Proofs.....	36
Analysis.....	27	Resources for Teachers.....	37
Applied Mathematics.....	29	Now Available Electronically.....	39
Calculus.....	30	Title Index.....	49
Geometry.....	32		

## ■ CARUS MATHEMATICAL MONOGRAPHS (CARUS MONOGRAPHS)

Expositions of mathematical subjects set forth in a manner comprehensible not only to teachers and students specializing in mathematics, but also to scientific workers in other fields. The monographs are intended for the wide circle of thoughtful people familiar with basic graduate or advanced undergraduate mathematics.

## ■ CLASSROOM RESOURCE MATERIALS

Provides materials for classroom use by students, including student-research projects, lab exercises or problem sets, other supplemental handouts, innovative texts, and the like. May sometimes include disks.

## ■ DOLCIANI MATHEMATICAL EXPOSITIONS (DOLCIANI)

Aims at a broad audience. Assumed levels of background range up to that of an undergraduate mathematics major.

## ■ MAA NOTES

Rapidly disseminates educational information and reports as well as resources for faculty use.

## ■ ANNELI LAX NEW MATHEMATICAL LIBRARY (ANNELI LAX NML)

Features fresh approaches, enrichment material, and broad coverage of topics especially suitable for high school and the first two years of college.

## ■ SPECTRUM

Targets the general mathematically-interested reader with broad coverage of biographies, popular works, and monographs of general interest.

## ■ PROBLEM BOOKS

A variety of books related to problems and problem-solving, including annual collections of problems from mathematical competitions, collections of problems specific to particular branches of mathematics, and books on the art and practice of problem-solving.

## ■ MAA TEXTBOOKS

MAA Textbooks cover all levels of the undergraduate curriculum, with a focus on textbooks for upper division students. They are written by college and university faculty, and are carefully reviewed by an editorial board of teaching faculty in order to ensure superior exposition.

Dear Colleague,

A few years ago one of my advisees, let's call him Harry, was explaining to me how he managed to get a D on his chemistry midterm, "Joey, my textbook partner, had the book and didn't answer my texts for the week leading up to the exam. "What's a textbook partner?" you ask. So did I. Turns out Harry and his buddy figured that if they both took the same chemistry course they could share a single \$300 textbook. Harry learned the hard way the flaw in this scheme.

The point of the story is not Harry's lack of foresight, or Joey's misunderstanding of the notion of communal property. The point of the story is that the existence of \$300 textbooks causes our students to behave in ways that lead to sub-optimal learning outcomes.

Just for fun I started thinking about what \$300 would buy in this catalogue:

### First year:

Calculus for the Life Sciences..... \$35  
*a year-long course with an emphasis on modeling*

### Sophomore year:

Ordinary Differential Equations..... \$30  
*a modern approach*

Essentials of Mathematics..... \$22  
*an introduction to proof*

Thinking Geometrically..... \$30  
*there's enough here for a year-long course*

### Junior year:

An Invitation to Real Analysis..... \$30  
*a new MAA book!*

The Lebesgue Integral for Undergraduates..... \$25  
*a second course in analysis*

Learning Modern Algebra..... \$34

### Senior year:

Number Theory through Inquiry..... \$25

Combinatorics: A Problem-Oriented Approach..... \$21

First Concepts of Topology..... \$15

A Tour through Mathematical Logic..... \$30

There you go—the \$302 math major. Obviously I don't think anybody is going to major exclusively in MAA textbooks, but the marketplace is full of wildly overpriced mediocre textbooks. Look at the authors of these books: Michael Starbird, Joe Rotman, Norman Steenrod, Anne Noonburg, Tom Sibley! And I didn't even include our textbooks by David Bressoud, Ivan Niven, Fernando Gouvea, Dan Kalman, Roger Nelsen, and the Boases (Ralph and Harold). World-class exposition is the MAA brand. Incredible value is a result of the MAA community's commitment to our students and their learning.

Page through this catalogue. You will surely find many possible textbooks and supplements that will help you with your teaching mission. You will also find a wide variety of expository, pedagogical, and historical works to keep you informed, enlightened, and up-to-date.

Enjoy,



Steve Kennedy, MAA Acquisitions Editor  
kennedy@maa.org

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Visit [maa.org/press/ebooks](http://maa.org/press/ebooks).

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## Examination Copies

To request an examination copy of one of our textbooks, please send your request on departmental letterhead to:

Mathematical Association of America  
Examination Copy  
P.O. Box 91112  
Washington, DC 20090-1112

Include the name of your course, the estimated class size, and the adoption decision date.

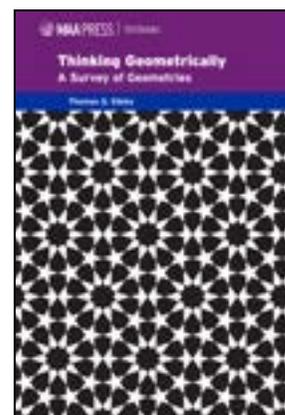
You may also fax your request on department letterhead to (240) 396-5647.

## Translation Rights

For inquiries regarding translation rights please contact:  
Samantha Webb at [swebb@maa.org](mailto:swebb@maa.org).

## Book Proposals

For information about submitting a manuscript please contact:  
Steve Kennedy at [kennedy@maa.org](mailto:kennedy@maa.org) or Carol Baxter at [cbaxter@maa.org](mailto:cbaxter@maa.org).



## Thinking Geometrically: A Survey of Geometries

By Thomas Q. Sibley

■ MAA Textbooks

A well written and comprehensive survey of college geometry that would serve a wide variety of courses for both mathematics majors and mathematics education majors. Great care and attention is spent on developing visual insights and geometric intuition while stressing the logical structure, historical development and deep interconnectedness of the ideas. All students, mathematics and mathematics education majors in particular, will benefit from the book's emphasis of developing reasoning and intuition.

Code: TGSG  
eISBN: 978-1-61444-619-4  
586 pp., 2015  
PDF Price: \$30.00

Students with less mathematical preparation than upper-division mathematics majors can successfully study the topics needed for the preparation of high school teachers. There is a multitude of exercises and projects in those chapters developing all aspects of geometric thinking for these students as well as for more advanced students. These chapters include Euclidean Geometry, Axiomatic Systems and Models, Analytic Geometry, Transformational Geometry, and Symmetry. Topics in the other chapters, including Non-Euclidean Geometry, Projective Geometry, Finite Geometry, Differential Geometry and Discrete Geometry, provide a broader view of geometry. Instructors can pick and choose a variety of different topics to suit their tastes and design a number of different geometry courses. The different chapters are as independent as possible, while the text still manages to highlight the many connections between topics.

The text is self-contained, including appendices with the material in Euclid's first book and a high school axiomatic system as well as Hilbert's axioms. Appendices give brief summaries of the parts of linear algebra and multivariable calculus needed for certain chapters. While some chapters use the language of groups, no prior experience with abstract algebra is presumed. The text will support an approach emphasizing dynamical geometry software without being tied to any particular software.

\*DRM protected. See page 3 for more information.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

MAA Books

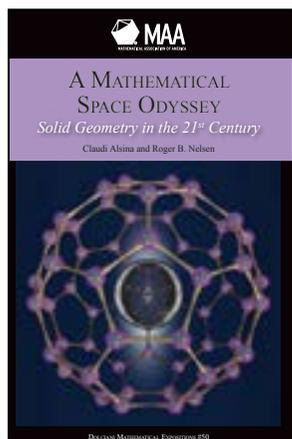
Check out the MAA Books Blog at [maabooks.blogspot.com](http://maabooks.blogspot.com).



Find us on [Facebook](https://www.facebook.com/maa.org).



Follow us on [Twitter](https://twitter.com/maa.org).



Code: DOL-50  
eISBN: 978-1-61444-216-5  
260 pp., 2015  
PDF Price: \$25.00

## A Mathematical Space Odyssey

By Claudi Alsina & Roger B. Nelsen

■ Dolciani Mathematical Expositions

Solid geometry is the traditional name for what we call today the geometry of three dimensional Euclidean space. Courses in solid geometry have largely disappeared from American high schools and colleges. The authors are convinced that a mathematical exploration of three-dimensional geometry merits some attention in today's curriculum. *A Mathematical Space Odyssey: Solid Geometry in the 21st Century* is devoted to presenting techniques for proving a variety of mathematical results in three-dimensional space, techniques that may improve one's ability to think visually.

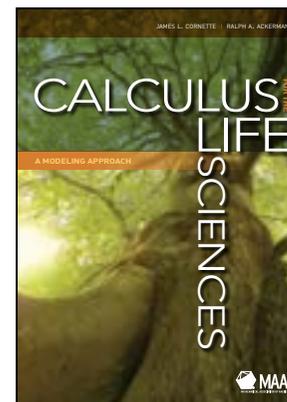
Special attention is given to the classical icons of solid geometry (prisms, pyramids, platonic solids, cones, cylinders and spheres) and many new and classical results: Cavalieri's principle, Commandino's theorem, de Gua's theorem, Prince Rupert's cube, the Menger sponge, the Schwarz lantern, Euler's rotation theorem, the Loomis-Whitney inequality, Pythagorean theorems in three dimensions, etc.

The authors devote a chapter to each of the following basic techniques for exploring space and proving theorems: enumeration, representation, dissection, plane sections, intersection, iteration, motion, projection, and folding and unfolding. In addition to many figures illustrating theorems and their proofs, we have included a selection of photographs of three-dimensional works of art and architecture.

Each chapter includes a selection of Challenges for the reader to explore further properties and applications. The book concludes with solutions to all the Challenges in the book, references and a complete index. Readers should be familiar with high school algebra, plane and analytic geometry, and trigonometry. While brief appearances of calculus do occur, no knowledge of calculus is necessary to enjoy this book.

The authors hope that both secondary school and college and university teachers may wish to use portions of it as an introduction to solid geometry, as a supplement in problem solving sessions, as enrichment material in a course on proofs and mathematical reasoning, or in a mathematics course for liberal arts students.

Also be available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



Code: CLS  
eISBN: 978-1-61444-615-6  
732 pp., 2015  
PDF Price: \$35.00

## Calculus for the Life Sciences: A Modeling Approach

By James L. Cornette & Ralph A. Ackerman

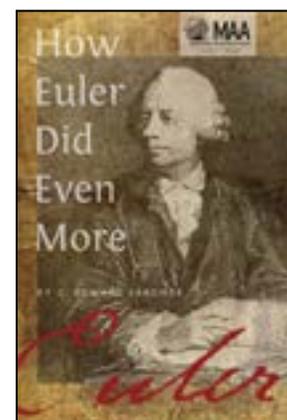
■ MAA Textbooks

Freshman and sophomore life sciences students respond well to the modeling approach to calculus, difference equations, and differential equations presented in this book. Examples of population dynamics, pharmacokinetics, and biologically relevant physical processes are introduced in Chapter 1, and these and other life sciences topics are developed throughout the text.

The ultimate goal of calculus for many life sciences students primarily involves modeling living systems with difference and differential equations. Understanding the concepts of derivative and integral is crucial, but the ability to compute a large array of derivatives and integrals is of secondary importance.

The students should have studied algebra, geometry and trigonometry, but may be life sciences students because they have not enjoyed their previous mathematics courses. This text can help them understand the relevance and importance of mathematics to their world. It is not a simplistic approach, however, and indeed is written with the belief that the mathematical depth of a course in calculus for the life sciences should be comparable to that of the traditional course for physics and engineering students.

\*DRM protected. See page 3 for more information.



Code: HEDM  
eISBN: 978-1-61444-519-7  
240 pp., 2015  
PDF Price: \$21.00

## How Euler Did Even More

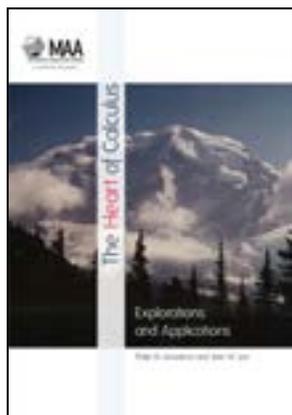
By C. Edward Sandifer

■ Spectrum

"Read Euler, read Euler, he is master of us all," LaPlace exhorted us. And it is true, Euler writes with unerring grace and ease. He is exceptionally clear thinking and clear speaking. It is a joy and a pleasure to follow him. It is especially so with Ed Sandifer as your guide. Sandifer has been studying Euler for decades and is one of the world's leading experts on his work.

This volume is the second collection of Sandifer's "How Euler Did It" columns. Each is a jewel of historical and mathematical exposition. The sum total of years of work and study of the most prolific mathematician in history, this volume will leave you marveling at Euler's clever inventiveness and Sandifer's wonderful ability to explicate and put it all in context.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## The Heart of Calculus: Explorations and Applications

By Philip M. Anselone & John W. Lee

■ Classroom Resource Materials

This book contains enrichment material for courses in first and second year calculus, differential equations, modeling, and introductory real analysis. It targets talented students who seek a deeper understanding of calculus and its applications. The book can be used in honors courses, undergraduate seminars, independent study, capstone courses taking a fresh look at calculus, and summer enrichment programs. The book develops topics from novel and/or unifying perspectives. Hence, it is also a valuable resource for graduate teaching assistants developing their academic and pedagogical skills and for seasoned veterans who appreciate fresh perspectives.

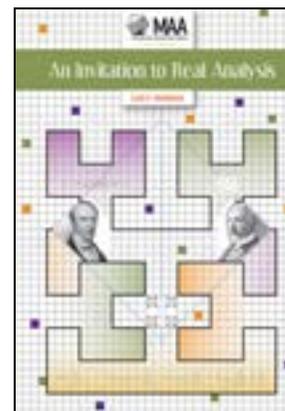
The explorations, problems, and projects in the book impart a deeper understanding of and facility with the mathematical reasoning that lies at the heart of calculus and conveys something of its beauty and depth.

A high level of rigor is maintained. However, with few exceptions, proofs depend only on tools from calculus and earlier. Analytical arguments are carefully structured to avoid epsilons and deltas. Geometric and/or physical reasoning motivates challenging analytical discussions. Consequently, the presentation is friendly and accessible to students at various levels of mathematical maturity. Logical reasoning skills at the level of proof in Euclidean geometry suffice for a productive use of the book.

There are 16 chapters in the book, divided about equally between pure and applied mathematics. The first three chapters are on fundamentals of differential calculus and the last three are on the monumental discoveries of Newton and Kepler on celestial motion and gravitation. The intervening chapters present significant topics in pure and applied mathematics chosen for their intrinsic interest, historical influence, and continuing importance. There is great flexibility in the choice of which chapters to cover and the order of coverage because chapters are essentially independent of each other.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

Code: HCEA  
eISBN: 978-1-61444-118-2  
300 pp., 2015  
PDF Price: \$24.00



## An Invitation to Real Analysis

By Luis Moreno

■ MAA Textbooks

*An Invitation to Real Analysis* is written both as a stepping stone to higher calculus and analysis courses, and as foundation for deeper reasoning in applied mathematics. This book also provides a broader foundation in real analysis than is typical for future teachers of secondary mathematics. In connection with this, within the chapters, students are pointed to numerous articles from *The College Mathematics Journal* and *The American Mathematical Monthly*. These articles are inviting in their level of exposition and their wide-ranging content.

Axioms are presented with an emphasis on the distinguishing characteristics that new ones bring, culminating with the axioms that define the reals. Set theory is another theme found in this book, beginning with what students are familiar with from basic calculus. This theme runs underneath the rigorous development of functions, sequences, and series, and then ends with a chapter on transfinite cardinal numbers and with

Code: IRA  
eISBN: 978-1-61444-617-0  
680 pp., 2015  
PDF Price: \$30.00

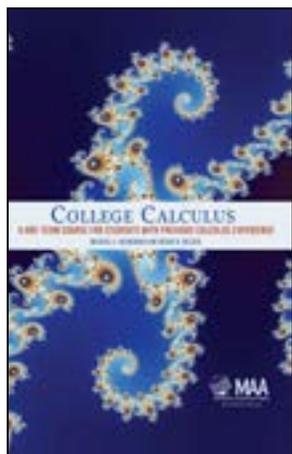
chapters on basic point-set topology.

Differentiation and integration are developed with the standard level of rigor, but always with the goal of forming a firm foundation for the student who desires to pursue deeper study. A historical theme interweaves throughout the book, with many quotes and accounts of interest to all readers.

Over 600 exercises and dozens of figures help the learning process. Several topics (continued fractions, for example), are included in the appendices as enrichment material. An annotated bibliography is included.

\*DRM protected. See page 3 for more information.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## College Calculus: A One-Term Course for Students with Previous Calculus Experience

By Michael E. Boardman & Roger B. Nelsen

■ MAA Textbooks

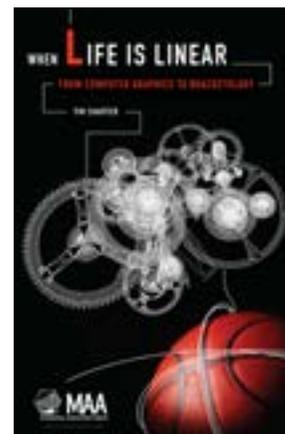
*College Calculus: A One-Term Course for Students with Previous Calculus Experience* is a textbook for students who have successfully experienced an introductory calculus course in high school. *College Calculus* begins with a brief review of some of the content of the high school calculus course, and proceeds to give students a thorough grounding in the remaining topics in single variable calculus, including integration techniques, applications of the definite integral, separable and linear differential equations, hyperbolic functions, parametric equations and polar coordinates, L'Hôpital's rule and improper integrals, continuous probability models, and infinite series. Each chapter concludes with several "Explorations," extended discovery investigations to supplement that chapter's material.

Code: CCA  
eISBN: 978-1-61444-616-3  
470 pp., 2015  
PDF Price: \$30.00

The text is ideal as the basis of a course focused on the needs of prospective majors in the STEM disciplines (science, technology, engineering, and mathematics). A one-term course based on this text provides students with a solid foundation in single variable calculus and prepares them for the next course in college level mathematics, be it multivariable calculus, linear algebra, a course in discrete mathematics, statistics, etc.

\*DRM protected. See page 3 for more information.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## When Life is Linear: From Computer Graphics to Bracketology

By Tim Chartier

■ Anneli Lax New Mathematical Library

*If you can't imagine what linear algebra is good for, read this book, get captivated and start to explore on your own.*

–Dieter Riebesehl, Zentralblatt MATH

*The book can serve as its own resource or to supplement a course on linear algebra.*

–Mathematical Reviews Clippings

*Tim Chartier has written the perfect supplement to a linear algebra course. Every major topic is driven by applications, such as computer graphics, cryptography, webpage ranking, sports ranking and data mining. Anyone reading this book will have a clear understanding of the power and scope of linear algebra.*

–Arthur Benjamin, Harvey Mudd College

Code: NML-45  
eISBN: 978-0-88385-988-9  
140 pp., 2015  
PDF Price: \$23.00

*Not only is it true that "Life Is Linear," as Tim Chartier asserts, but through his engaging style and modern, enticing applications he brings linear algebra to life. This small volume will be a popular read by math fans of all ages and of all backgrounds. Finally we have a little book that focuses on the utility and power of the theorems of linear algebra and makes that exploration joyful.*

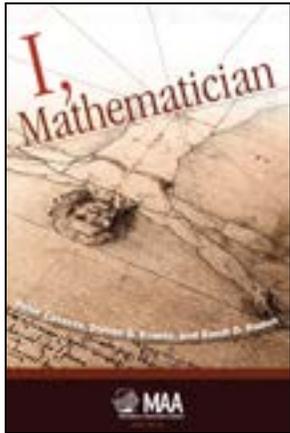
–Edward B. Burger, President and Professor, Southwestern University

*I'm often asked which areas of mathematics should students study. I always say linear algebra. However, typical linear algebra texts I've seen either have very few applications, or the applications are contrived and not very relevant to students. Chartier's text is a refreshing change as it is driven by real-world applications that are inspiring and familiar to his audience. From Google searches and image processing to sports rankings and (my favorite) computer graphics.*

–Tony DeRose, Pixar Animation Studios

From simulating complex phenomenon on supercomputers to storing the coordinates needed in modern 3D printing, data is a huge and growing part of our world. A major tool to manipulate and study this data is linear algebra. *When Life is Linear* introduces concepts of matrix algebra with an emphasis on application, particularly in the fields of computer graphics and data mining. Readers will learn to make an image transparent, compress an image and rotate a 3D wireframe model. In data mining, readers will use linear algebra to read zip codes on envelopes and encrypt sensitive information. Chartier details methods behind web search, utilized by such companies as Google, and algorithms for sports ranking which have been applied to creating brackets for March Madness and predict outcomes in FIFA World Cup soccer. The book can serve as its own resource or to supplement a course on linear algebra.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



Code: IMA  
eISBN: 978-1-61444-521-0  
320 pp., 2015  
PDF Price: \$25.00

## I, Mathematician

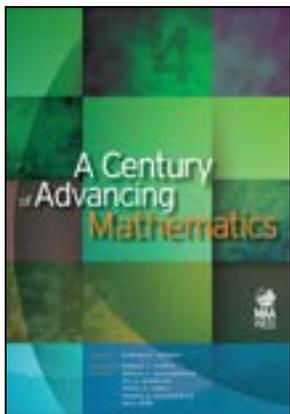
Peter Casazza, Steven G. Krantz, & Randi D. Ruden,  
Editors

■ Spectrum

Mathematicians have pondered the psychology of the members of our tribe probably since mathematics was invented, but for certain since Hadamard's *The Psychology of Invention in the Mathematical Field*. The editors asked two dozen prominent mathematicians (and one spouse thereof) to ruminate on what makes us different. The answers they got are thoughtful, interesting and thought-provoking.

Not all respondents addressed the question directly. Michael Atiyah reflects on the tension between truth and beauty in mathematics. T.W. Körner, Alan Schoenfeld and Hyman Bass chose to write, reflectively and thoughtfully, about teaching and learning. Others, including Ian Stewart and Jane Hawkins, write about the sociology of our community. Many of the contributions range into philosophy of mathematics and the nature of our thought processes. Any mathematician will find much of interest here.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



Code: CAM  
eISBN: 978-1-61444-522-7  
420 pp., 2015  
PDF Price: \$30.00

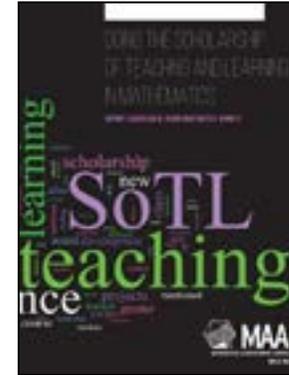
## A Century of Advancing Mathematics

Stephen Kennedy, Donald J. Albers, Gerald L.  
Alexanderson, Della Dumbaugh, Frank A. Farris,  
Deanna B. Haunsperger, & Paul Zorn; Editors

The MAA was founded in 1915 to serve as a home for *The American Mathematical Monthly*. The mission of the Association—to advance mathematics, especially at the collegiate level—has, however, always been larger than merely publishing world-class mathematical exposition. MAA members have explored more than just mathematics; we have, as this volume tries to make evident, investigated mathematical connections to pedagogy, history, the arts, technology, literature, every field of intellectual endeavor. Essays, all commissioned for this volume, include exposition by Bob Devaney, Robin Wilson, and Frank Morgan; history from Karen Parshall, Della Dumbaugh, and Bill Dunham; pedagogical discussion from Paul Zorn, Joe Gallian, and Michael Starbird, and cultural commentary from Bonnie Gold, Jon Borwein, and Steve Abbott.

This volume contains 35 essays by all-star writers and expositors writing to celebrate an extraordinary century for mathematics—more mathematics has been created and published since 1915 than in all of previous recorded history. We've solved age-old mysteries, created entire new fields of study, and changed our conception of what mathematics is. Many of those stories are told in this volume as the contributors paint a portrait of the broad cultural sweep of mathematics during the MAA's first century. Mathematics is the most thrilling, the most human, area of intellectual inquiry; you will find in this volume compelling proof of that claim.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



Code: NTE-83  
eISBN: 978-1-61444-318-6  
210 pp., 2015  
PDF Price: \$23.00  
Print on Demand: \$43.00

## Doing the Scholarship of Teaching and Learning in Mathematics

Jacqueline M. Dewar & Curtis Bennett, Editors

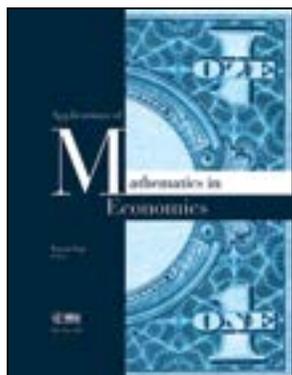
■ MAA Notes

The Scholarship of Teaching and Learning (SoTL) movement encourages faculty to view teaching “problems” as invitations to conduct scholarly investigations. In this growing field of inquiry faculty bring their disciplinary knowledge and teaching experience to bear on questions of teaching and learning. They systematically gather evidence to develop and support their conclusions. The results are to be peer reviewed and made public for others to build on.

This Notes volume is written expressly for collegiate mathematics faculty who want to know more about conducting scholarly investigations into their teaching and their students' learning. Envisioned and edited by two mathematics faculty, the volume serves as a how-to guide for doing SoTL in mathematics.

The four chapters in Part I provide background on this form of scholarship and specific instructions for undertaking a SoTL investigation in mathematics. Part II contains 15 examples of SoTL projects in mathematics from 14 different institutions, both public and private, spanning the spectrum of higher educational institutions from community colleges to research universities. These chapters “reveal the process of doing SoTL” by illustrating many of the concepts, issues, methods and procedures discussed in Part I. An Editors' Commentary opens each contributed chapter to highlight one or more aspects of the process of doing SoTL revealed within. Toward the end of each chapter the contributing authors describe the benefits that accrued to them and their careers from participating in SoTL.

The final chapter in the volume, the Epilogue, represents a synthesis by the editors of the contributing authors' perceptions of the value of SoTL. This volume has two goals: to assist mathematics faculty interested in undertaking a scholarly study of their teaching practice and to promote a greater understanding of this work and its value to the mathematics community.



## Applications of Mathematics in Economics

Warren Page, Editor

■ MAA Notes

*Applications of Mathematics in Economics is not intended to teach economics. Instead, it would be well suited for teachers of upper-level high school or undergraduate mathematics courses who are looking for real-world applications for the mathematics they teach.*

—Mathematics Teacher

*Applications of Mathematics in Economics* presents an overview of the (qualitative and graphical) methods and perspectives of economists. It is intended to give instructors a sense of what mathematics is used at the undergraduate level in various parts of economics, and to provide students with the opportunities to apply their mathematics in relevant economics contexts.

The volume's applications span a broad range of topics from microeconomics, macroeconomics, behavioral economics, econometrics,

financial economics, and mathematical economics. Each article consists of self-contained, stand-alone, expository sections whose problems illustrate what mathematics is used, and how, in that subdiscipline of economics. Overall, the volume's 47 sections contain more than 100 multipart problems that vary across areas of mathematics and in levels of sophistication. Since each section is self-contained, instructors can readily tailor (simplify or embellish) its worked-out solutions to their students' needs. Thus, instructors have an abundance of material to select for classroom uses, homework assignments, and enrichment activities.

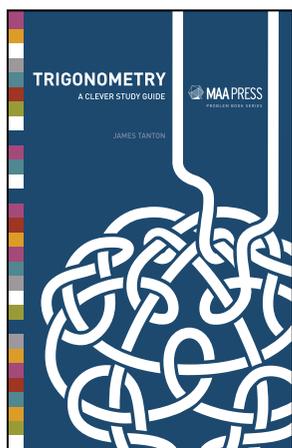
Code: NTE-82

eISBN: 978-0-61444-317-9

156 pp., 2013

PDF Price: \$24.00

Print on Demand: \$40.00



## Trigonometry: A Clever Study Guide

James Tanton

■ MAA Problem Books

This guide covers the story of trigonometry. It is a swift overview, but it is complete in the context of the content discussed in beginning and advanced high-school courses. The purpose of these notes is to supplement and put into perspective the material of any course on the subject you may have taken or are currently taking. (These notes will be tough going for those encountering trigonometry for the very first time!)

In reading and working through the material presented here you will:

- » see the story in of trigonometry in a new light
- » see the reasons why we, mankind, developed the subject in the way we did
- » begin to move away from memorization and half-understanding to deep understanding and thereby be equipped for agile, clever thinking in the subject

Code: CLP1

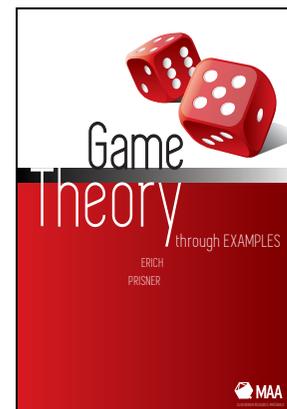
eISBN: 978-1-61444-406-0

232 pp., 2015

PDF Price: \$15.00

These notes will guide you through to sound mathematical doing in trigonometry and, of course, to sound problem-solving skills as well.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Game Theory through Examples

By Erich Prisner

■ Classroom Resource Materials

*This book would be a valuable resource of examples for any instructor teaching topics from game theory. It would also be a good text for a general education course that seeks to engage the students in exploratory projects in this aspect of applied mathematics.*

—Joel Haack, MAA Reviews

This book is a thorough introduction to elementary game theory, covering finite games with complete information.

The core philosophy underlying this volume is that abstract concepts are best learned when encountered first (and repeatedly) in concrete settings. Thus, the essential ideas of game theory are presented here in the context of actual games, real games much more complex and rich than the typical toy examples. All the fundamental ideas are here: Nash equilibria, backward induction, elementary probability, imperfect

Code: GTE

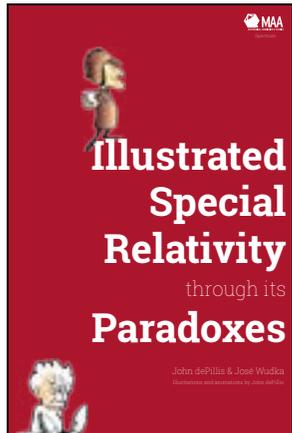
eISBN: 978-1-61444-115-1

375 pp., 2014

PDF Price: \$27.00

information, extensive and normal form, mixed and behavioral strategies. The active-learning, example-driven approach makes the text suitable for a course taught through problem solving. Students will be thoroughly engaged by the extensive classroom exercises, compelling homework problems and nearly 60 projects in the text. Also available are approximately 80 Java applets and three dozen Excel spreadsheets in which students can play games and organize information in order to acquire a gut feeling to help in the analysis of the games. Mathematical exploration is a deep form of play, that maxim is embodied in this book.

*Game Theory through Examples* is a lively introduction to this appealing theory. Assuming only high school prerequisites makes the volume especially suitable for a liberal arts or general education spirit-of-mathematics course. It could also serve as the active-learning supplement to a more abstract text in an upper-division game theory course.



## Illustrated Special Relativity through Its Paradoxes: A Fusion of Linear Algebra, Graphics, and Reality

By John dePillis & José Wudka

■ Spectrum

*This book delivered exactly what I was looking for. Presupposing only a modest background in physics, it takes the reader on a tour of special relativity, concentrating on half a dozen of the paradoxes of the subject. The discussion throughout the book is clear and accessible, but does not flee from mathematics; some knowledge of calculus and matrices would certainly stand the reader in good stead.*

—Mark Hunacek, MAA Reviews

Code: ISR  
eISBN: 978-1-61444-517-3  
478 pp., 2013  
PDF Price: \$33.00

This work shows that linear algebra is a natural language for special relativity. *Illustrated Special Relativity through Its Paradoxes* illustrates and resolves several apparent paradoxes of Special Relativity including the twin paradox and train-and-tunnel paradox. Assuming a minimum of technical prerequisites the authors introduce inertial frames and use them to explain a variety of phenomena: the nature of simultaneity, the proper way to add velocities, and why faster-than-light travel is impossible. Most of these explanations are contained in the resolution of apparent paradoxes, including some lesser-known ones: the pea-shooter paradox, the bug-and-rivet paradox, and the accommodating universe paradox. The explanation of time and length contraction is especially clear and illuminating.

The roots of Einstein's work in Maxwell's lead the authors to devote several chapters to an exposition of Maxwell's equations. The authors establish that those equations predict a frame-independent speed for the propagation of electromagnetic radiation, a speed that equals that of light. Several chapters are devoted to experiments of Roemer (SYMBOL!), Fizeau, and de Sitter to measure the speed of light and the Michelson-Morley experiment abolishing the aether.

Throughout the exposition is thorough, but not overly technical, and often illustrated by cartoons. The volume might be suitable for a one-semester general-education introduction to Special Relativity. It is especially well-suited for self-study by interested laypersons or to use as a supplement to a more traditional text.



## 101 Careers in Mathematics Third Edition

Andrew Sterrett, Editor

■ Classroom Resource Materials

*These new profiles provide additional evidence of the imaginative use to which mathematics majors apply their degrees.*

—Mathematical Reviews Clippings

*I can't think of a better book for advisers to share with students. For anyone with any interest in mathematical careers, pick it up and browse. The sheer variety is fascinating.*

—Bill Satzer, MAA Reviews

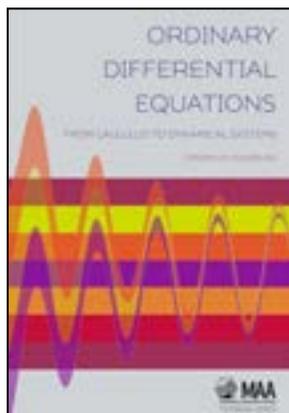
Catalog Code: OCM-3  
eISBN: 978-1-61444-116-8  
334 pp., 2014  
PDF Price: \$20.00

This third edition of the immensely popular, *101 Careers in Mathematics*, contains updates on the career paths of individuals profiled in the first and second editions, along with many new profiles. No career counselor should be without this valuable resource.

The authors of the essays in this volume describe a wide variety of careers for which a background in the mathematical sciences is useful.

Each of the jobs presented shows real people in real jobs. Their individual histories demonstrate how the study of mathematics was useful in landing good-paying jobs in predictable places such as IBM, AT&T, and American Airlines, and in surprising places such as FedEx Corporation, L.L. Bean, and Perdue Farms, Inc. You will also learn about job opportunities in the Federal Government as well as exciting careers in the arts, sculpture, music, and television. There are really no limits to what you can do if you are well prepared in mathematics.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Ordinary Differential Equations: From Calculus to Dynamical Systems

By V.W. Noonburg

■ MAA Textbooks

*This is a textbook that could be used for an undergraduate course in ordinary differential equations. It is substantially cheaper than most of the alternatives from commercial publishers, it is well written, and it appears to have been carefully proofread.*

–Mathematical Reviews Clippings

*The author's writing style is very clear and should be quite accessible to most students reading the book. There are lots of worked examples and interesting applications, including some fairly unusual ones. ...This book offers a clean, concise, modern, reader-friendly approach to the subject, at a price that won't make an instructor feel guilty about assigning it.*

– Mark Hunacek, MAA Reviews

Code: FCDS  
eISBN: 978-1-61444-614-9  
334 pp., 2014  
PDF Price: \$30.00

This book presents a modern treatment of material traditionally covered in the sophomore-level course in ordinary differential equations. While this course is usually required for engineering students the material is attractive to students in any field of applied science, including those in the biological sciences.

The standard analytic methods for solving first and second-order differential equations are covered in the first three chapters. Numerical and graphical methods are considered, side-by-side with the analytic methods, and are then used throughout the text. An early emphasis on the graphical treatment of autonomous first-order equations leads easily into a discussion of bifurcation of solutions with respect to parameters.

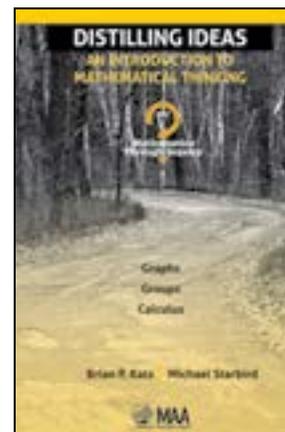
The fourth chapter begins the study of linear systems of first-order equations and includes a section containing all of the material on matrix algebra needed in the remainder of the text. Building on the linear analysis, the fifth chapter brings the student to a level where two-dimensional nonlinear systems can be analyzed graphically via the phase plane. The study of bifurcations is extended to systems of equations, using several compelling examples, many of which are drawn from population biology. In this chapter the student is gently introduced to some of the more important results in the theory of dynamical systems. A student project, involving a problem recently appearing in the mathematical literature on dynamical systems, is included at the end of Chapter 5.

A full treatment of the Laplace transform is given in Chapter 6, with several of the examples taken from the biological sciences. An appendix contains completely worked-out solutions to all of the odd-numbered exercises.

The book is aimed at students with a good calculus background that want to learn more about how calculus is used to solve real problems in today's world. It can be used as a text for the introductory differential equations course, and is readable enough to be used even if the class is being "flipped." The book is also accessible as a self-study text for anyone who has completed two terms of calculus, including highly motivated high school students. Graduate students preparing to take courses in dynamical systems theory will also find this text useful.

\*DRM protected. See page 3 for more information.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Distilling Ideas: An Introduction to Mathematical Thinking

By Brian P. Katz & Michael Starbird

■ MAA Textbooks

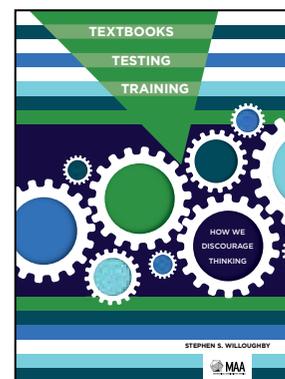
This text guides its users to develop the skills, attitudes, and habits of mind of a mathematician. It presents a carefully designed sequence of exercises and theorem statements so that its users will be guided to discover both mathematical ideas and also strategies of proofs and strategies of thinking. People who use this book will learn and enjoy the process of distilling and exploring ideas. This book helps to foster habits of inquiry through the exploration of interesting mathematical content including graphs, groups, and epsilon-delta calculus.

This book can be used as a text for an introduction to proof course that is taught using an inquiry-based learning strategy of instruction. The three mathematical topics—graphs, groups, and calculus—are independent, and each helps students develop theorem-proving skills and strategies of thinking. As a whole, they give students a good experience with mathematical exploration in three core areas of mathematics.

Code: DIMT  
eISBN: 978-1-61444-613-2  
190 pp., 2013  
PDF Price: \$26.00

\*DRM protected. See page 3 for more information.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Textbooks, Testing, Training: How We Discourage Thinking

By Stephen S. Willoughby

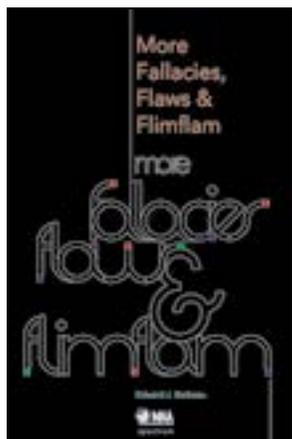
■ Spectrum

*Willoughby's essay is a gem. It should be in the hands of every young teacher. I wish that I had read it many years ago. I have no doubt that many of his observations and the information he imparts will remain with me for a while. I certainly hope so. A collection of reminiscences from other teachers with their valuable insights and experiences (who could write with such expertise as he does) would make a fine addition to the education literature.*

– James Tattersall, Providence College

Code: TTT  
eISBN: 978-1-61444-803-7  
63 pp., 2014  
PDF Price: \$11.00  
Print on Demand: \$18.00

Stephen S. Willoughby has taught mathematics for 59 years and he has seen everything. Some of it has annoyed him, some has inspired him. This little book is something of a valedictory and he shares some parting thoughts as he contemplates the end of his teaching career. Willoughby has strong, cogent and mostly negative opinions about textbooks, standardized testing, and teacher training. These opinions have been forged in the cauldron of the classroom of a deeply caring teacher. They might not please you, but they ought to make you think. They should spark needed debate in our community. Ultimately this is a human tale with rough parallels to *Hardy's Apology*, replace "Mathematician's" with "Teacher's" perhaps. Every teacher will sympathize with Willoughby's frustrations and empathize with the humanity and compassion that animated his life's work and that beat at the center of this book.



## More Fallacies, Flaws, and Flimflam

By Edward Barbeau

■ Spectrum

*The book is entertaining and challenging, and the logical progression of topics makes it even more appealing. More Fallacies, Flaws, and Flimflam is a great addition to the library of any teacher of mathematics.*

—Tamara DuBois, Mathematics Teacher

*It is a fact of human existence that we learn more from our mistakes than we do from our successes. When applied to mathematics this principle allows us to gain insight from the mistakes of others. Some of these examples are amusing but most are educational, worthy of being used in math classes to explain potential pitfalls.*

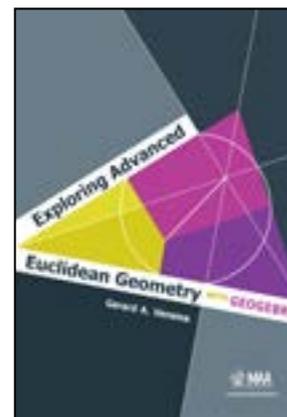
—Charles Ashbacher, *Journal of Recreational Mathematics*

*More Fallacies, Flaws, and Flimflam* is the second volume of collections from *Fallacies, Flaws, and Flimflam*, mostly drawn from the column of this name in *The College Mathematics Journal* between 2000 and 2008.

The first volume, *Mathematical Fallacies, Flaws, and Flimflam*, was published in 2000 by the MAA. As in the first volume, there is a variety of items ranging from howlers (outlandish procedures that nonetheless lead to a correct answer) to errors that are deep or subtle often made by strong students. While some are provided for entertainment, others offer a challenge to the reader to determine exactly where things go wrong.

The items are sorted according to subject matter. Elementary teachers will not find much of use beyond Chapter 1, while middle and high school teachers will find items in Chapters, 1,2,3,7, and 8 that they might use. College instructors should find material in every part of the book. There are frequent references to *The College Mathematics Journal*; these are denoted by CMJ.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Exploring Advanced Euclidean Geometry with GeoGebra

By Gerard Venema

■ Classroom Resource Materials

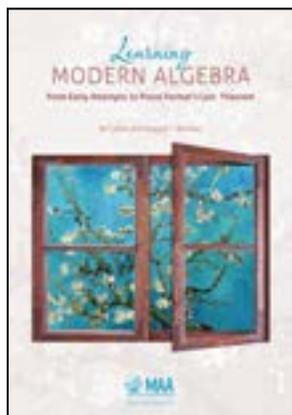
*Students, teachers, or anyone who enjoys geometrical beauty can take their time and savor the many wonderful theorems that this book contains. Whether used in a classroom setting or for individual instruction, every reader of Gerard Venema's Exploring Advanced Euclidean Geometry with GeoGebra is in for a feast of delectable geometry.*

—Michael Starbird

This book provides an inquiry-based introduction to advanced Euclidean geometry. It utilizes dynamic geometry software, specifically GeoGebra, to explore the statements and proofs of many of the most interesting theorems in the subject. Topics covered include triangle centers, inscribed, circumscribed, and escribed circles, medial and orthic triangles, the nine-point circle, duality, and the theorems of Ceva and Menelaus, as well as numerous applications of those theorems. The final chapter explores constructions in the Poincaré disk model for hyperbolic geometry.

The book can be used either as a computer laboratory manual to supplement an undergraduate course in geometry or as a stand-alone introduction to advanced topics in Euclidean geometry. The text consists almost entirely of exercises (with hints) that guide students as they discover the geometric relationships for themselves. First the ideas are explored at the computer and then those ideas are assembled into a proof of the result under investigation. The goals are for the reader to experience the joy of discovering geometric relationships, to develop a deeper understanding of geometry, and to encourage an appreciation for the beauty of Euclidean geometry.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Learning Modern Algebra: From Early Attempts to Prove Fermat's Last Theorem

By Al Cuoco & Joseph J. Rotman

■ MAA Textbooks

*The text serves as powerful example of how mathematics for teaching, particularly the opportunity to struggle with challenging problems and to develop mathematical habits of mind, can prove valuable for every mathematics major, not just those who plan to teach.*

—Kasi Allen, Mathematics Teacher

*Learning Modern Algebra aligns with the CBMS Mathematical Education of Teachers-II recommendations, in both content and practice. It emphasizes rings and fields over groups, and it makes explicit connections between the ideas of abstract algebra and the mathematics used by high school teachers. It provides opportunities for prospective and practicing teachers to experience mathematics for themselves, before the formalities are developed, and it is explicit about the mathematical habits of mind that lie beneath the definitions and theorems.*

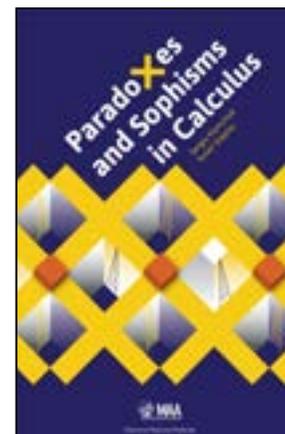
Code: LMA  
eISBN: 978-1-61444-612-5  
456 pp., 2013  
PDF Price: \$34.00

This book is designed for prospective and practicing high school mathematics teachers, but it can serve as a text for standard abstract algebra courses as well. The presentation is organized historically: the Babylonians introduced Pythagorean triples to teach the Pythagorean theorem; these were classified by Diophantus, and eventually this led Fermat to conjecture his Last Theorem. The text shows how much of modern algebra arose in attempts to prove this; it also shows how other important themes in algebra arose from questions related to teaching. Indeed, modern algebra is a very useful tool for teachers, with deep connections to the actual content of high school mathematics, as well as to the mathematics teachers use in their profession that doesn't necessarily "end up on the blackboard."

The focus is on number theory, polynomials, and commutative rings. Group theory is introduced near the end of the text to explain why generalizations of the quadratic formula do not exist for polynomials of high degree, allowing the reader to appreciate the more general work of Galois and Abel on roots of polynomials. Results and proofs are motivated with specific examples whenever possible, so that abstractions emerge from concrete experience. Applications range from the theory of repeating decimals to the use of imaginary quadratic fields to construct problems with rational solutions. While such applications are integrated throughout, each chapter also contains a section giving explicit connections between the content of the chapter and high school teaching.

\*DRM protected. See page 3 for more information.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Paradoxes and Sophisms in Calculus

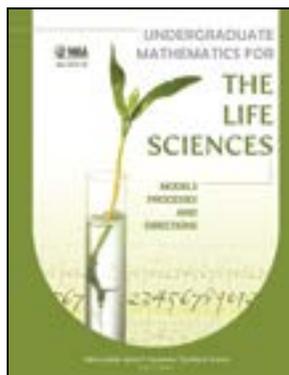
By Sergiy Klymchuk & Susan Staples

■ Classroom Resource Materials

*Paradoxes and Sophisms in Calculus* offers a delightful supplementary resource to enhance the study of single variable calculus. By the word paradox the authors mean a surprising, unexpected, counter-intuitive statement that looks invalid, but in fact is true. The word sophism describes intentionally invalid reasoning that looks formally correct, but in fact contains a subtle mistake or flaw. In other words, a sophism is a false proof of an incorrect statement. A collection of over 50 paradoxes and sophisms showcases the subtleties of this subject and leads students to contemplate the underlying concepts. A number of the examples treat historically significant issues that arose in the development of calculus, while others more naturally challenge readers to understand common misconceptions. Sophisms and paradoxes from the areas of functions, limits, derivatives, integrals, sequences, and series are explored. The book serves as a complementary companion to the first author's previous book *Counterexamples in Calculus*, MAA, recipient of the 2010 Outstanding Academic Title Award from Choice Magazine.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

Code: PAS  
eISBN: 978-1-61444-110-6  
108 pp., 2013  
PDF Price: \$20.00



## Undergraduate Mathematics for the Life Sciences: Models, Processes, and Directions

Glenn Ledder, Jenna Carpenter, & Timothy D. Comar, Editors

■ MAA Notes

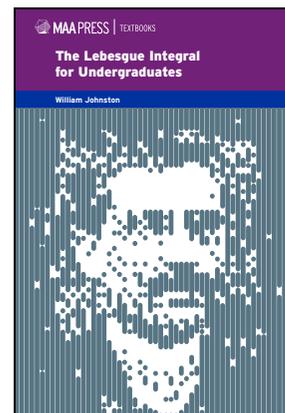
*This book superbly demonstrates how the typical mathematics professor can use real-life science contexts to teach mathematics concepts and engage students who are not majoring in mathematics. I highly recommend this book to any department looking to design a course in which mathematics is taught in a life science context.*

—Mathematics Teacher

Code: NTE-81  
eISBN: 978-1-61444-316-2  
226 pp., 2013  
PDF Price: \$25.00  
Print on Demand: \$43.00

This volume contains 26 articles for mathematics and biology faculty who want to develop courses and programs in mathematics for life science students. The articles are grouped into three parts: Models, Processes, and Directions. Articles in the Models section describe advanced undergraduate courses, alternatives to calculus courses for lower division

undergraduates, interdisciplinary courses of different levels, and complete curricula. Articles in the Processes section discuss the challenging issues involved in implementation and institutionalization of innovative courses and programs. The Directions section contains articles that suggest different approaches and priorities from what seem to be most widely held in the mathematics education community today. The authors represent a wide variety of academic institutions, from universities to community colleges, and all of the articles begin with information about the institutional context for the project. Many of the articles also include links to associated resources that can be found on the internet, and some have associated books in print as well. All emphasize features that could be applied to similar projects at other institutions and offer useful advice for the newcomer to mathematics curriculum development for life science students.



## The Lebesgue Integral for Undergraduates

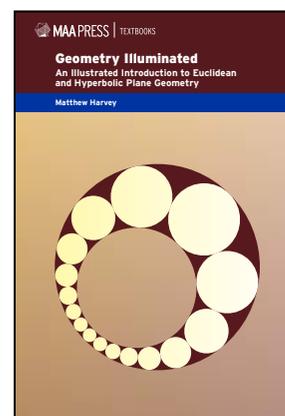
By William Johnston

■ MAA Textbooks

This text presents the Lebesgue integral at an accessible undergraduate level with surprisingly minimal prerequisites. Anyone who has mastered single-variable calculus concepts of limits, derivatives, and series can learn the material. The key to this success is the text's use of a method labeled the "Daniell-Riesz approach." The treatment is self-contained, and so the associated course, often offered as Real Analysis II, no longer needs Real Analysis I as a prerequisite. Additional curricular options then exist. Academic institutions can now offer a course on the integral (and function spaces) along with Complex Analysis and Real Analysis I, where completion of any one course enhances the other two. Students can enroll immediately after Calculus II, after a first course in mathematical proofs, or as a required course in function theory. Along with Vector Calculus and Probability Theory, this set of courses now provides a comprehensive undergraduate investigation into functions.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

Code: TLI  
eISBN: 978-1-61444-620-0  
296 pp., 2015  
PDF: \$25.00



## Geometry Illuminated: An Illustrated Introduction to Euclidean and Hyperbolic Plane Geometry

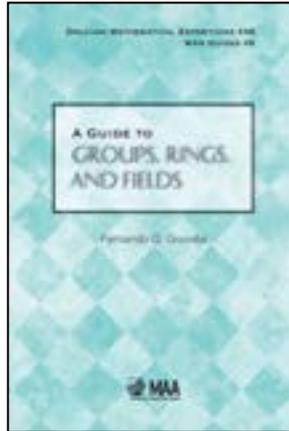
By Matthew Harvey

■ MAA Textbooks

*Geometry Illuminated* is an introduction to geometry in the plane, both Euclidean and hyperbolic. It is designed to be used in an undergraduate course on geometry, and as such, its target audience is undergraduate math majors. However, much of it should be readable by anyone who is comfortable with the language of mathematical proof. Throughout, the goal is to develop the material patiently. One of the more appealing aspects of geometry is that it is a very "visual" subject. This book hopes to take full advantage of that, with an extensive use of illustrations as guides.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

Code: GIL  
eISBN: 978-1-61444-618-7  
560 pp., 2015  
PDF Price: \$30



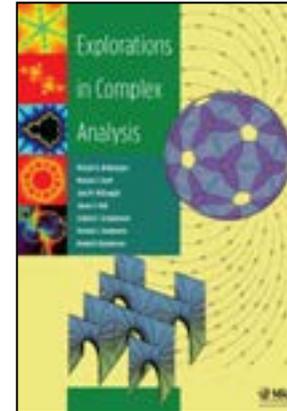
Code: D0L-48  
 eISBN: 978-1-61444-211-0  
 325 pp., 2012  
 PDF Price: \$27.50

## A Guide to Groups, Rings, and Fields By Fernando Gouvêa

■ Dolciani Mathematical Expositions

This *Guide* offers a concise overview of the theory of groups, rings, and fields at the graduate level, emphasizing those aspects that are useful in other parts of mathematics. It focuses on the main ideas and how they hang together. It will be useful to both students and professionals. In addition to the standard material on groups, rings, modules, fields, and Galois theory, the book includes discussions of other important topics that are often omitted in the standard graduate course, including linear groups, group representations, the structure of Artinian rings, projective, injective and flat modules, Dedekind domains, and central simple algebras. All of the important theorems are discussed, without proofs but often with a discussion of the intuitive ideas behind those proofs. Those looking for a way to review and refresh their basic algebra will benefit from reading this *Guide*, and it will also serve as a ready reference for mathematicians who make use of algebra in their work.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



Code: EXCA  
 eISBN: 978-0-88385-778-6  
 425 pp., 2012  
 PDF Price: \$33.00

## Explorations in Complex Analysis By Michael Brilleslyper, Michael Dorff, Jane McDougall, James Rolf, Lisbeth Schaubroeck, Richard Stankewitz, & Kenneth Stephenson

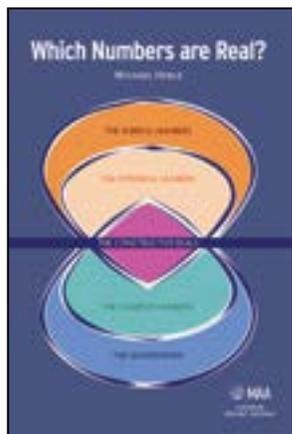
■ Classroom Resource Materials

This book is written for mathematics students who have encountered basic complex analysis and want to explore more advanced projects and/or research topics.

It could be used as (a) a supplement for a standard undergraduate complex analysis course, allowing students in groups or as individuals to explore advanced topics, (b) a project resource for a senior capstone course for mathematics majors, (c) a guide for an advanced student or a small group of students to independently choose and explore an undergraduate research topic, or (d) a portal for the mathematically curious, a hands-on introduction to the beauties of complex analysis.

Research topics in the book include complex dynamics, minimal surfaces, fluid flows, harmonic, conformal, and polygonal mappings, and discrete complex analysis via circle packing. The nature of this book is different from many mathematics texts: the focus is on student-driven and technology-enhanced investigation. Interlaced in the reading for each chapter are examples, exercises, explorations, and projects, nearly all linked explicitly with computer applets for visualization and hands-on manipulation. There are more than 15 Java applets that allow students to explore the research topics without the need for purchasing additional software.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



## Which Numbers are Real?

By Michael Henle

■ Classroom Resource Materials

Everyone knows the real numbers, those fundamental quantities that make possible all of mathematics from high school algebra and Euclidean geometry through the calculus and beyond; and also serve as the basis for measurement in science, industry, and ordinary life. This book surveys alternative real number systems: systems that generalize and extend the real numbers yet stay close to these properties that make the reals central to mathematics.

Alternative real numbers include many different kinds of numbers, for example multidimensional numbers (the complex numbers, the quaternions and others), infinitely small and infinitely large numbers (the hyperreal numbers and the surreal numbers), and numbers that represent positions in games (the surreal numbers).

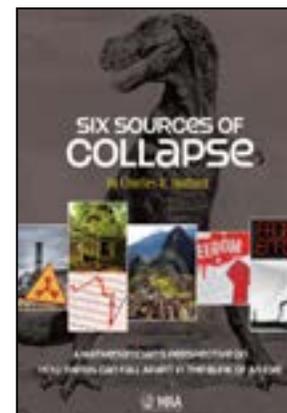
Each system has a well-developed theory, including applications to other areas of mathematics and science, such as physics, the theory of games,

multi-dimensional geometry, and formal logic. They are all active areas of current mathematical research and each has unique features, in particular, characteristic methods of proof and implications for the philosophy of mathematics, both highlighted in this book.

Alternative real number systems illuminate the central, unifying role of the real numbers and include some exciting and eccentric parts of mathematics. *Which Numbers Are Real?* will be of interest to anyone with an interest in numbers, but specifically to upper-level undergraduates, graduate students, and professional mathematicians, particularly college mathematics teachers.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

Code: WNR  
eISBN: 978-1-61444-107-6  
224 pp., 2012  
PDF Price: \$27.00



## Six Sources of Collapse

By Charles R. Hadlock

■ Spectrum

*Six Sources of Collapse is a wonderful book, in numerous ways. Chance, group behavior, evolutionary processes, instability, nonlinearity, and networks are adroitly brought under the same roof, and applied to a stunning range of important examples, from the collapse of ancient civilizations to the collapse of financial markets. Lucid engaging primers in relevant areas of mathematics—including non-linear differential equations, network theory, and extreme value statistics—are presented with an unpretentious informality attainable only by those with the deepest command. In effect, Hadlock offers both the call to arms, and the armamentarium, for a unified theory of collapse. An important scientific and pedagogical contribution.*

– Professor Joshua M. Epstein, Director of the Center for Advanced Modeling in the Social, Behavioral, and Health Sciences, Johns Hopkins University, and External Professor, Santa Fe Institute

Code: SSC  
eISBN: 978-1-61444-514-2  
221 pp., 2012  
PDF Price: \$25.00

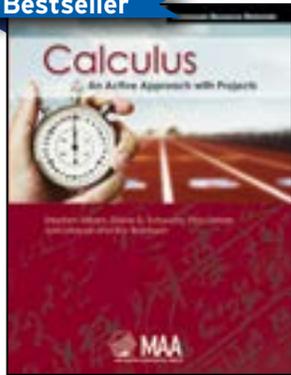
*Charles Hadlock's engaging book provides a mathematical framework for understanding all varieties of collapse—that of civilizations caused by environmental factors or destructive wars, companies caused by competition or poor management, and humans infected by contagious diseases. It inspires one to think about the reasons for collapse (Hadlock suggests six sources), and their mathematical basis, thereby providing guidance to the development of detailed, more specific models.*

– Professor Steven Brams, Professor of Politics, New York University

An important addition to the literature on complex systems, this book shows the common dynamics of collapses across a wide range of fields, such as business, engineering, ecology, political science, and others. Beginning with one of the most remarkable ecological collapses of recent time, that of the passenger pigeon, Hadlock goes on to survey numerous collapse processes in both the natural and man-made worlds. He takes us through extreme weather events, technological disasters, evolutionary processes, crashing markets and companies, the chaotic nature of Earth's orbit, revolutionary political change, the spread and elimination of disease, and many other fascinating cases. His key thesis is that one or more of six fundamental dynamics consistently show up across this wide range. These “six sources of collapse” can all be best described and investigated using fundamental mathematical concepts. They include low probability events, group dynamics, evolutionary games, instability, nonlinearity, and network effects, all of which are explained in readily understandable terms. Almost the entirety of the book can be understood by readers with a minimal mathematical background, but even quantitative experts are likely to get rich insights from the range of examples. The author tells his story with a warmly personal tone and weaves in many of his own experiences, whether from his consulting career of racing around the world trying to head off industrial disasters to his story of watching collapse after collapse in the evolution of an ecosystem on his New Hampshire farm.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

Bestseller



## Calculus: An Approach with Projects

By Stephan Hilbert, Diane D. Schwartz, Stan Seltzer, John Maceli, & Eric Robinson

■ Classroom Resource Materials

This volume contains student and instructor material for the delivery of a two-semester calculus sequence at the undergraduate level. It can be used in conjunction with any textbook. It was written with the view that students who are actively involved inside and outside the classroom are more likely to succeed, develop deeper conceptual understanding, and retain knowledge than students who are passive recipients of information.

The volume contains two main student sections. The first contains activities usually done in class, individually or in groups. Many of the activities allow students to participate in the development of central calculus ideas. The second section contains longer projects where students work in groups outside the classroom. These projects may involve material already presented, motivate concepts, or introduce supplementary topics.

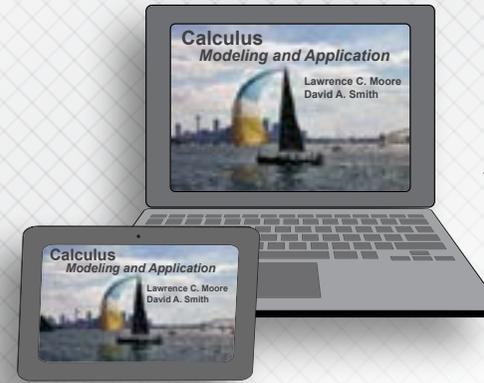
Code: ICP  
eISBN: 978-0-88385-972-8  
331 pp., 2010  
PDF Price: \$27.50  
Print on Demand: \$50.00

In addition to facilitating active student learning, the material will foster student comprehension of calculus as a unified subject. It provides many opportunities for students to make connections between different calculus topics. Unifying threads appear throughout the activities and projects. These threads include graphical calculus, distance and velocity, multiple representations of functions, estimation and approximation, and mathematical modeling.

Student thinking and communication are promoted through use of activities and projects where students need to organize their thinking, determine problem-solving strategies, and clearly communicate results to others.

Instructor materials contained in the volume include comments and notes on each project and activity, guidelines on their implementation, and a sample curriculum that incorporates a collection of activities and projects.

## MAA's Online Interactive Calculus Textbook Only \$35 for a full year's access!



*"We have been using this text, in one version or another, for about 20 years. It emphasizes a deep understanding of the material rather than just rote memorization. The interactivity is pretty cool, too."*

— Betty Mayfield, Hood College

## Calculus: Modeling and Application

By Lawrence C. Moore and David A. Smith

### Features:

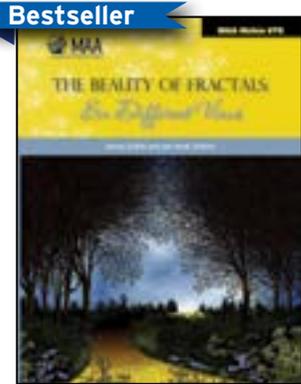
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**Tablet/Sage Version.** This version was written for the iPad, but will run on other tablets or computers in either Safari or Firefox (but not Internet Explorer or Chrome). It uses the free computer algebra system Sage to provide interactivity through remotely-processed interacts. Requires Internet access (both to display the math correctly and to use the interacts).

It is important to note that this textbook is a website. To learn more, visit [www.maa.org/ebooks/onlinecalc](http://www.maa.org/ebooks/onlinecalc).

Sample chapters (chapters 2, 5, and 8) are freely available online at [calculuscourse.maa.org/sample](http://calculuscourse.maa.org/sample).

Order online at: [maa.pinnaclecart.com](http://maa.pinnaclecart.com)



**Bestseller**  
**Code:** NTE-76  
**eISBN:** 978-0-88385-971-1  
**140 pp., 2010**  
**PDF Price:** \$25.00  
**Print on Demand:** \$50.00  
**Price per Chapter:** \$7.00  
*Includes full color plates of fractals referenced in the book.*

**The Beauty of Fractals**  
**Denny Gulick & Jon Scott, Editors**

■ MAA Notes

*Each of the essays is self-contained and can be understood by anyone with a background in algebra up through matrix representations and the mathematics of iterations. The images will excite children all the way down through middle school as they see how mathematics can make realistic images.*

– Charles Ashbacher, Journal of Recreational Mathematics

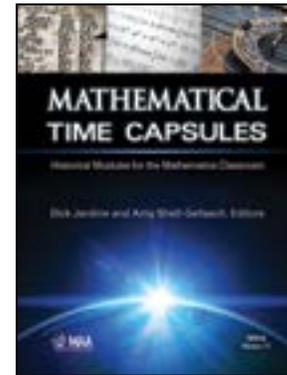
*Fractals are beautiful and, as a consequence, there are oversize books that provide scores of pictures and little else. While the present volume includes pretty pictures, especially in the first chapter/paper, it emphasizes the mathematical beauty of fractals.*

– CHOICE

Fractals came onto the stage in the 1970's with the emergence of the Mandelbrot set, with its incredibly complicated and interesting boundary. During the 1980's a number of books appeared—including those most especially by Mandelbrot, Barnsley, and Devaney—that gave a mathematical background for fractals that made them accessible to

both students and teachers. More recently, as computers and their users have become more sophisticated, the domain of fractals has broadened, from art to scientific application to mathematical analysis. In particular, students in high school as well as college are often introduced to fractals and fractal concepts. *The Beauty of Fractals: Six Different Views* includes six essays related to fractals, with perspectives different enough to give readers a taste of the breadth of the subject.

The six essays appearing in this book can be grouped as follows: the first two have a more descriptive nature; the first in terms of pictorial images that are fractals and the second in terms of fractals that appear in the famous stage play *Arcadia*. The third, fourth, and fifth essays are devoted to the famous classical fractals and their close relatives. The sixth essay connects differential equations to fractals. The last two essays are co-authored with undergraduate students. Each essay is self-contained and expository, and is accessible to a broad audience that includes college teachers, high school teachers, advanced undergraduate students, and others who wish to learn or teach about topics in fractals that do not usually appear in textbooks on fractals.



**Code:** NTE-77  
**eISBN:** 978-0-88385-984-1  
**204 pp., 2011**  
**PDF Price:** \$30.00  
**Print on Demand:** \$55.00  
**Price per Chapter:** \$7.00

**Mathematical Time Capsules**  
**Dick Jardine & Amy Shell-Gellasch, Editors**

■ MAA Notes

*Mathematical Time Capsules* offers teachers historical modules for immediate use in the mathematics classroom that include relevant history-based activities for a wide range of undergraduate and secondary mathematics courses.

A time capsule can be defined as a container preserving articles and records from the past for scholars of the future. Readers who open the book will find articles and activities from mathematics history that enhance the learning of topics typically associated with undergraduate or secondary mathematics curricula. Each capsule presents one topic, or perhaps a few related topics, or a historical thread that can be used throughout a course. The capsules were written by experienced practitioners to provide teachers with the historical background, suggested classroom activities, and further references and resources on the subject addressed. After reading a capsule, a teacher will be able

to engage students in at least one activity rich in the history of mathematics. Most of the historical topics contained in a capsule can be implemented in one class period with minimal additional preparation on the part of the teacher.

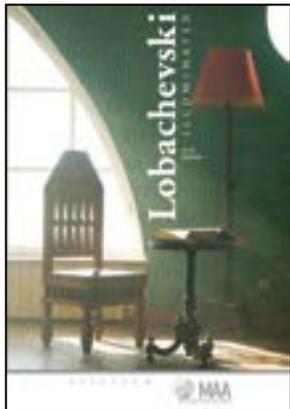


**Code:** NTE-78  
**eISBN:** 978-1-61444-300-1  
**288 pp., 2011**  
**PDF Price:** \$32.50  
**Print on Demand:** \$55.00  
**Price per Chapter:** \$7.00

**Recent Developments on Introducing a Historical Dimension in Mathematics Education**

**Victor Katz & Constantinos Tzanakis, Editors**  
 ■ MAA Notes

There has been increased interest in recent years in the use of the history of mathematics in the teaching of mathematics. In particular, in response to suggestions made in the volume *History and Mathematics Education of the International Commission on Mathematics Instruction*, many researchers around the world are now conducting empirical studies of the use of history in the mathematics classroom to get more insight into its educational implications. To further the goal of making these new results available to a wider audience, including mathematics educators, mathematics faculty in secondary schools and universities, and historians of mathematics, the editors have collected articles stemming from contributions to this field that were presented originally at recent meetings of the International Study Group on the Relations Between History and Pedagogy of Mathematics (the HPM Group), the European Summer University on the History and Epistemology in Mathematics Education (ESU), and the Congress of the European Society for Research in Mathematics Education (CERME). The purpose of the articles is to move the field forward and provide faculty with many new ideas for incorporating the history of mathematics into their teaching at various levels of education.



2015 Beckenbach Book Prize Winner

### Lobachevski Illuminated

By Seth Braver

■ Spectrum

*The writing is clear and lucid, illustrated with many of the author's own diagrams. In addition to clearly explaining Lobachevski's proofs of his propositions, the author also sometimes gives supplementary arguments as well as historical comments.*

– Mathematical Reviews

*Seth Braver doesn't just interpret the existing contents of Lobachevski's Theory of Parallels, but he continually adds to it by way of making it more mathematically coherent. In this respect, his achievement is first rate and it is equaled by his eloquently inspiring literary style. ...He succeeds with his aim of taking the reader back 170 years into an approach to geometry that has long been buried under streamlined modern renditions of non-Euclidean geometry.*

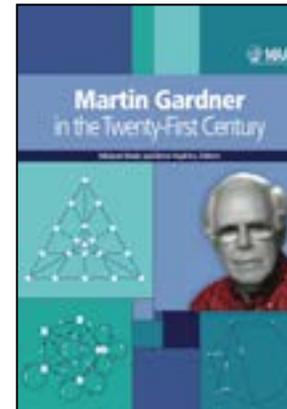
– MAA Reviews

Code: LBI  
eISBN: 978-0-88385-979-7  
200 pp., 2011  
PDF Price: \$28.00  
Print on Demand: \$47.50

Nikolai Ivanovich Lobachevski's trailblazing explorations of non-Euclidean geometry constitute a crucial episode in the history of mathematics, but they were not widely recognized as such until after his death. Consequently, when non-Euclidean geometry finally found a sympathetic audience in the late 19th century, the subject was reinterpreted in the light of intervening developments which were foreign to Lobachevski's own way of thinking. Because our modern understanding of his work derives from these reinterpretations, many of Lobachevski's strikingly beautiful ideas have been forgotten, and remain unknown to all but a handful of mathematicians today.

*Lobachevski Illuminated* seeks to recover this "lost mathematics" by introducing readers to classical non-Euclidean geometry through one of its most important original sources: a small treatise that Lobachevski published in German in 1840, *Geometrische Untersuchungen zur Theorie der Parallellinien* (*Geometric Investigations of the Theory of Parallels*). Within the pages of *Lobachevski Illuminated*, readers are guided, step-by-step, through a new translation of Lobachevski's little book. Although Lobachevski's text is challenging to read on its own, carefully arranged "illuminations" provide extensive commentary that situates Lobachevski's work in its mathematical, historical, and philosophical context, granting readers a vision of the world of non-Euclidean geometry as seen through the eyes of one of its discoverers.

Lobachevski's work is accessible to any reader comfortable with high school mathematics. It can be used as a primary text or as supplementary reading for courses in geometry or in the history of mathematics.



### Martin Gardner in the Twenty-First Century

Michael Henle & Brian Hopkins, Editors

Martin Gardner enormously expanded the field of recreational mathematics with the Mathematical Games columns he wrote for *Scientific American* for over 25 years and the more than 70 books he published. He also had a long relationship with the Mathematical Association of America, publishing articles in the MAA journals right up to his death in 2010. This book collects articles Gardner wrote for the MAA in the 21st century, together with other articles the MAA published from 1999 to 2012 that spring from and comment on his work.

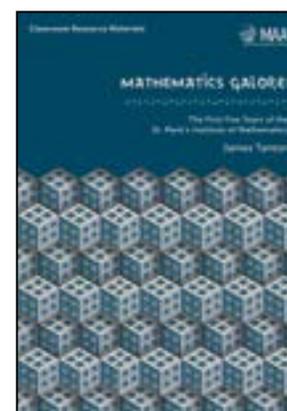
Martin Gardner's interests spanned geometry, number theory, graph theory, and probability, always communicated with engaging exposition often including games and puzzles. Eight works by Gardner himself, published between 1999 and 2010, are collected here and represent the breadth of his work, including his short fiction and lifelong interest in debunking pseudo-science. The remaining 33 chapters were written in response to Gardner's work and include several articles addressing open

Code: MGD  
eISBN: 978-1-61444-801-3  
350 pp., 2012  
PDF Price: \$25.00

questions he posed. They come from *The American Mathematical Monthly*, *Mathematics Magazine*, *The College Mathematics Journal*, and *Math Horizons* and demonstrate how Gardner's influence continues beyond his columns for *Scientific American*.

Although he took no mathematics in college, Martin Gardner inspired many mathematicians, professional and amateur, and his work was informed by frequent correspondence with other mathematics aficionados, both famous and unknown. He was even the basis for a character in a popular novel; his review of that work is included here. This book is a tribute to the deep and lasting impact of this prolific and brilliant writer. It is for anyone who, like Martin Gardner, loves mathematics.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



### Mathematics Galore!

By James Tanton

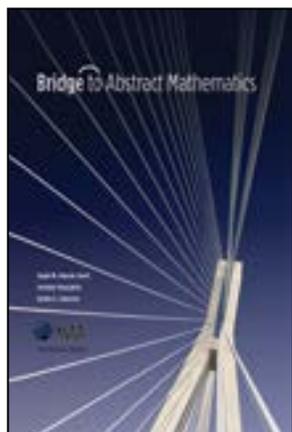
■ Classroom Resource Materials

*Mathematics Galore!* showcases some of the best activities and student outcomes of the St. Mark's Institute of Mathematics and invites you to engage the mathematics yourself! Revel in the delight of deep intellectual play and marvel at the heights to which young scholars can rise. See some great mathematics explained and proved via natural and accessible means.

Based on 26 essays ("newsletters") and eight additional pieces, *Mathematics Galore!* offers a large sample of mathematical tidbits and treasures, each immediately enticing, and each a gateway to layers of surprising depth and conundrum. Pick and read essays in no particular order and enjoy the mathematical stories that unfold. Be inspired for your courses, your math clubs and your math circles, or simply enjoy for yourself the bounty of research questions and intriguing puzzlers that lie within.

Code: MAG  
eISBN: 978-1-61444-103-8  
286 pp., 2012  
PDF Price: \$26.00

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).



### Bridge to Abstract Mathematics

By Ralph Oberste-Vorth, Aristides Mouzakis, & Bonita A. Lawrence

■ MAA Textbooks

A *Bridge to Abstract Mathematics* will prepare the mathematical novice to explore the universe of abstract mathematics. Mathematics is a science that concerns theorems that must be proved within the constraints of a logical system of axioms and definitions, rather than theories that must be tested, revised, and retested. Readers will learn how to read mathematics beyond popular computational calculus courses. Moreover, readers will learn how to construct their own proofs.

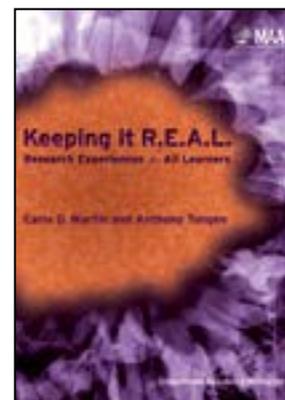
The book is intended as the primary text for an introductory course in proving theorems, as well as for self-study or as a reference. Throughout the text, some pieces (usually proofs) are left as exercises; Part V gives hints to help students find good approaches to the exercises. Part I introduces the language of mathematics and the methods of proof. The mathematical content of Parts II through IV were chosen so as not to

seriously overlap the standard mathematics major. In Part II, students study sets, functions, equivalence and order relations, and cardinality. Part III concerns algebra. The goal is to prove that the real numbers form the unique, up to isomorphism, ordered field with the least upper bound; in the process, we construct the real numbers starting with the natural numbers. Students will be prepared for an abstract linear algebra or modern algebra course. Part IV studies analysis. Continuity and differentiation are considered in the context of time scales (nonempty closed subsets of the real numbers). Students will be prepared for advanced calculus and general topology courses.

\*DRM protected. See page 3 for more information.

Also available in print at [maa-store.hostedbywebstore.com](http://maa-store.hostedbywebstore.com).

Code: BTAM  
eISBN: 978-1-61444-606-4  
252 pp., 2012  
PDF Price: \$30.00



### Keeping it R.E.A.L.: Research Experiences for All Learners

By Carla D. Martin & Anthony Tongen

■ Classroom Resource Materials

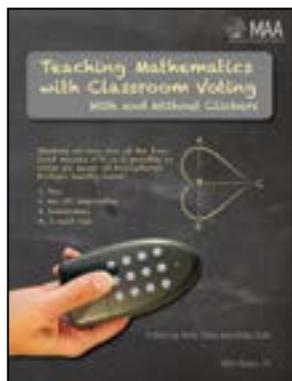
*Keeping it R.E.A.L.: Research Experiences for All Learners* is a collection of computational projects designed to inspire critical thinking and mathematical inquiry. R.E.A.L. projects are suitable for students with minimal computational exposure and a pre-calculus background to upper level students in a numerical analysis course. Most of the projects do not involve high-level mathematical theory and are accessible to students at many levels. These projects can be classified as short term research projects that reinforce material covered in class and use real-life applications in a variety of fields.

The authors use self-discovery methods to share these projects and provide a framework for incorporating undergraduate research in the classroom. The result is a set of easily adaptable course materials that can be used to inspire creativity and encourage undergraduate research.

Code: KIR  
eISBN: 978-0-88385-961-2  
141 pp., 2011  
PDF Price: \$22.50  
Print on Demand: \$45.00

Each project has been class-tested and most have been presented as posters at regional conferences.

Each R.E.A.L. project includes: goals of the project; reactions from students who have worked on the project; mathematical and technological prerequisites; author advice in implementing the project or common student pitfalls; extensive background section and references on each subject to help instructors implement the project.



## Teaching Mathematics with Classroom Voting

Kelly Cline & Holly Zullo, Editors

■ MAA Notes

Classroom voting is a teaching method that can be used to create engaging lectures in the college and university mathematics classroom. Using this method, the instructor poses a multiple-choice question to the class, gives them a few minutes to work through the question and discuss it in small groups before each student votes on the correct answer, often using an electronic “clicker.” The vote gives the instructor immediate feedback from each individual in the class. Most importantly, the vote requires every single student to play an active role, to grapple with some mathematical issue, to discuss it in a small group, and to register an opinion.

How can you teach all the necessary topics and still include votes with discussions? How do you integrate these votes into a class period? Where can you find good questions to pose, or do you have to write them all yourself? How are students likely to react to this new teaching system? What can you do if 90% of your class votes incorrectly?

Code: NTE-79  
eISBN: 978-1-61444-301-8  
250 pp., 2011  
PDF Price: \$27.50  
Print on Demand: \$50.00

To address these questions this collection includes papers from faculty at institutions across the country. In this volume, these faculty share their experiences and explain how they have used classroom voting to engage students, to provoke discussions, and to improve how they teach mathematics.

The first section of this volume provides general background information on classroom voting and addresses foundational issues such as whether to use electronic clickers and how to conduct the votes. The papers in the second section address the effectiveness of classroom voting as a pedagogy in teaching mathematics. The third section is devoted to papers in which faculty discuss how they use classroom voting in specific courses such as algebra, statistics, precalculus, calculus, linear algebra, differential equations, and abstract algebra.

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101 Careers in Mathematics.....17

**A**

Aha! Solutions.....47  
Algebra and Tiling.....39  
Analytic Functions of a Complex Variable.....39  
Applications of Mathematics in Economics.....14  
Arithmetic Theory of Quadratic Forms, The.....43

**B**

Beautiful Mathematics.....45  
Beauty of Fractals, The.....32  
Bridge to Abstract Mathematics.....36

**C**

Calculus: An Approach with Projects.....30  
Calculus and Its Origins.....43  
Calculus Deconstructed.....40  
Calculus for the Life Sciences: A Modeling Approach..7  
Calculus: Modeling and Application.....31  
Celestial Mechanics.....40  
Century of Advancing Mathematics.....12  
Charming Proofs.....42  
College Calculus: A One-Term Course for Students with Previous Calculus Experience.....10  
Combinatorial Mathematics.....41  
Combinatorics: A Guided Tour.....41  
Combinatorics: A Problem Oriented Approach.....41  
Complex Analysis: A Geometric Viewpoint.....39  
Contest Problem Book I.....47  
Contest Problem Book II.....47  
Contest Problem Book III.....47  
Contest Problem Book IV.....47  
Contest Problem Book IX.....47  
Contest Problem Book V.....47  
Contest Problem Book VI.....47  
Contest Problem Book VII.....47  
Contest Problem Book VIII.....47  
Continued Fractions.....44  
Counterexamples in Calculus.....41  
Creative Mathematics.....45  
Current Practices in Quantitative Literacy.....46

**D**

Dedekind Sums.....44

Differential Geometry and Its Applications.....42

Distilling Ideas: An Introduction to Mathematical Thinking.....19

Doing the Scholarship of Teaching and Learning in Mathematics.....13

**E**

Elementary Cryptanalysis.....41  
Elementary Mathematical Models: Order Aplenty and a Glimpse of Chaos.....40  
Episodes from the Early History of Mathematics.....43  
Episodes in 19th and 20th Century Euclidean Geometry.....43  
Episodic History of Mathematics, An: Mathematical Culture Through Problem Solving.....43  
Ergodic Theory of Numbers.....45  
Essentials of Mathematics.....39  
Excursions in Classical Analysis.....39  
Explorations in Complex Analysis.....27  
Exploring Advanced Euclidean Geometry with GeoGebra.....21

**F**

Field Theory and Its Classical Problems.....39  
First Concepts of Topology.....46  
First Steps for Math Olympians: Using the American Mathematics Competitions.....47  
Five Hundred Mathematical Challenges.....45  
Fourier Series.....40  
Fourier Series and Orthogonal Polynomials.....43  
Fresh Start for Collegiate Mathematics, A.....46  
Friendly Mathematics Competition, A.....47  
From Calculus to Computers.....43  
From Error-Correcting Codes through Sphere Packings to Simple Groups.....41  
From Pythagoras to Einstein.....42  
Functions, Data, and Models: An Applied Approach to College Algebra.....39

**G**

Game Theory and Strategy.....42  
Game Theory through Examples.....15  
Garden of Integrals, A.....41  
Generalized Riemann Integral, The.....40  
Geometric Inequalities.....42  
Geometric Transformations I.....42

Geometric Transformations II ..... 42  
 Geometric Transformations III ..... 42  
 Geometric Transformations IV ..... 42  
 Geometry Illuminated: An Illustrated Introduction to Euclidean and Hyperbolic Plane Geometry ..... 25  
 Geometry of Numbers ..... 42  
 Geometry Revisited ..... 42  
 Graphs and Their Uses ..... 43  
 Graph Theory: A Problem Oriented Approach ..... 43  
 Great Moments in Mathematics After 1650 ..... 43  
 Great Moments in Mathematics Before 1650 ..... 44  
 Groups and Their Graphs ..... 43  
 Guide to Advanced Linear Algebra, A ..... 39  
 Guide to Advanced Real Analysis, A ..... 40  
 Guide to Complex Variables, A ..... 41  
 Guide to Elementary Number Theory, A ..... 45  
 Guide to Groups, Rings, and Fields, A ..... 26  
 Guide to Plane Algebraic Curves, A ..... 39  
 Guide to Real Variables, A ..... 41  
 Guide to Topology, A ..... 47

**H**  
 Hands on History ..... 44  
 Harmony of the World: 75 Years of Mathematics Magazine ..... 44  
 Heart of Calculus: Explorations and Applications ..... 8  
 Historian Looks Back, A ..... 44  
 Historical Modules for the Teaching and Learning of Mathematics ..... 44  
 How Euler Did Even More ..... 7  
 Hungarian Problem Book I ..... 47  
 Hungarian Problem Book II ..... 47  
 Hungarian Problem Book III ..... 48  
 Hungarian Problem Book IV ..... 48

**I**  
 Icons of Mathematics ..... 42  
 Illustrated Special Relativity through Its Paradoxes: A Fusion of Linear Algebra, Graphics, and Reality ..... 16  
 I, Mathematician ..... 12  
 Inequalities from Complex Analysis ..... 40  
 Ingenuity in Mathematics ..... 45  
 Innovative Approaches to Undergraduate Mathematics Courses Beyond Calculus ..... 46

International Mathematical Olympiads 1959-1977 ..... 48  
 International Mathematical Olympiads 1978-1985 ..... 48  
 International Mathematical Olympiads 1986-1999 ..... 48  
 In the Dark on the Sunny Side: A Memoir of an Out-of-Sight Mathematician ..... 44  
 Introduction to Inequalities, An ..... 45  
 Invitation to Number Theory ..... 45  
 Invitation to Real Analysis ..... 9  
 Irrational Numbers ..... 45

**K**  
 Keeping it R.E.A.L.: Research Experiences for All Learners ..... 37  
 Knot Theory ..... 42

**L**  
 Learning Modern Algebra: From Early Attempts to Prove Fermat's Last Theorem ..... 22  
 Learning to Teach and Teaching to Learn Mathematics ..... 46  
 Lebesgue Integral for Undergraduates, The ..... 25  
 Lie Groups: A Problem-Oriented Introduction via Matrix Groups ..... 39  
 Linear Algebra Problem Book ..... 39  
 Lobachevski Illuminated ..... 34  
 Lore of Large Numbers, The ..... 41

**M**  
 Making the Connection: Research and Teaching in Undergraduate Mathematics Education ..... 46  
 Martin Gardner in the Twenty-First Century ..... 35  
 Mathematical Fallacies, Flaws, and Flimflam ..... 46  
 Mathematical Interest Theory ..... 40  
 Mathematical Interest Theory, Student Manual ..... 40  
 Mathematical Methods in Science ..... 44  
 Mathematical Miniatures ..... 48  
 Mathematical Orchard, A: Problems and Solutions ..... 48  
 Mathematical Reminiscences ..... 45  
 Mathematical Space Odyssey ..... 6  
 Mathematical Statistics ..... 44  
 Mathematical Time Capsules ..... 33  
 Mathematician Comes of Age, A ..... 45  
 Mathematics and Sports ..... 45  
 Mathematics for Secondary School Teachers ..... 46  
 Mathematics Galore! ..... 35

Mathematics in Historical Context ..... 44  
 Mathematics of Choice ..... 41  
 Mathematics of Games and Gambling ..... 42  
 Math Made Visual ..... 43  
 Moore Method, The: A Pathway to Learner-Centered Instruction ..... 46  
 More Fallacies, Flaws, and Flimflam ..... 20

**N**  
 New Horizons in Geometry ..... 43  
 Noncommutative Rings ..... 39  
 Non-Euclidean Geometry ..... 43  
 Numbers: Rational and Irrational ..... 45  
 Number Theory Through Inquiry ..... 45

**O**  
 Ordinary Differential Equations: From Calculus to Dynamical Systems ..... 18  
 Over and Over Again ..... 42

**P**  
 Panorama of Harmonic Analysis, A ..... 40  
 Paradoxes and Sophisms in Calculus ..... 23  
 Primer of Real Functions, A ..... 40  
 Proof and Other Dilemmas ..... 46  
 Proofs That Really Count ..... 41

**R**  
 Randomness and Recurrence in Dynamical Systems ..... 40  
 Random Walks and Electric Networks ..... 40  
 Recent Developments on Introducing a Historical Dimension in Mathematics Education ..... 33  
 Rediscovering Mathematics: You Do the Math ..... 45  
 Resources for Teaching Discrete Mathematics ..... 46  
 Riddles of the Sphinx ..... 45  
 Rings and Ideals ..... 39  
 Role of Mathematics in Science, The ..... 44

**S**  
 Schwartz Function and Its Applications, The ..... 40  
 Sensual Quadratic Form, The ..... 39  
 She Does Math ..... 41  
 Sherlock Holmes in Babylon ..... 44  
 Sink or Float? Thought Problems in Math and Physics ..... 48

Six Sources of Collapse ..... 29  
 Solve This ..... 48  
 Sophie's Diary ..... 44  
 Statistical Independence in Probability, Analysis and Number Theory ..... 40

**T**  
 Teaching Mathematics with Classroom Voting ..... 38  
 Ten Mathematical Acrostics ..... 46  
 Textbooks, Testing, Training: How We Discourage Thinking ..... 19  
 Thinking Geometrically: A Survey of Geometries ..... 5  
 Tour through Mathematical Logic, A ..... 44  
 Trigonometry: A Clever Study Guide ..... 14

**U**  
 Undergraduate Mathematics for the Life Sciences: Models, Processes, and Directions ..... 24  
 USA Mathematical Olympiads 1972-1986 ..... 48  
 Uses of Infinity ..... 41

**V**  
 Vectors and Matrices ..... 39  
 Visual Group Theory ..... 39

**W**  
 War Stories from Applied Math ..... 46  
 What is Calculus About? ..... 41  
 When Less Is More ..... 47  
 When Life is Linear: From Computer Graphics to Bracketology ..... 11  
 Which Numbers are Real? ..... 28  
 Who Gave You the Epsilon? ..... 44  
 Words of Mathematics ..... 46