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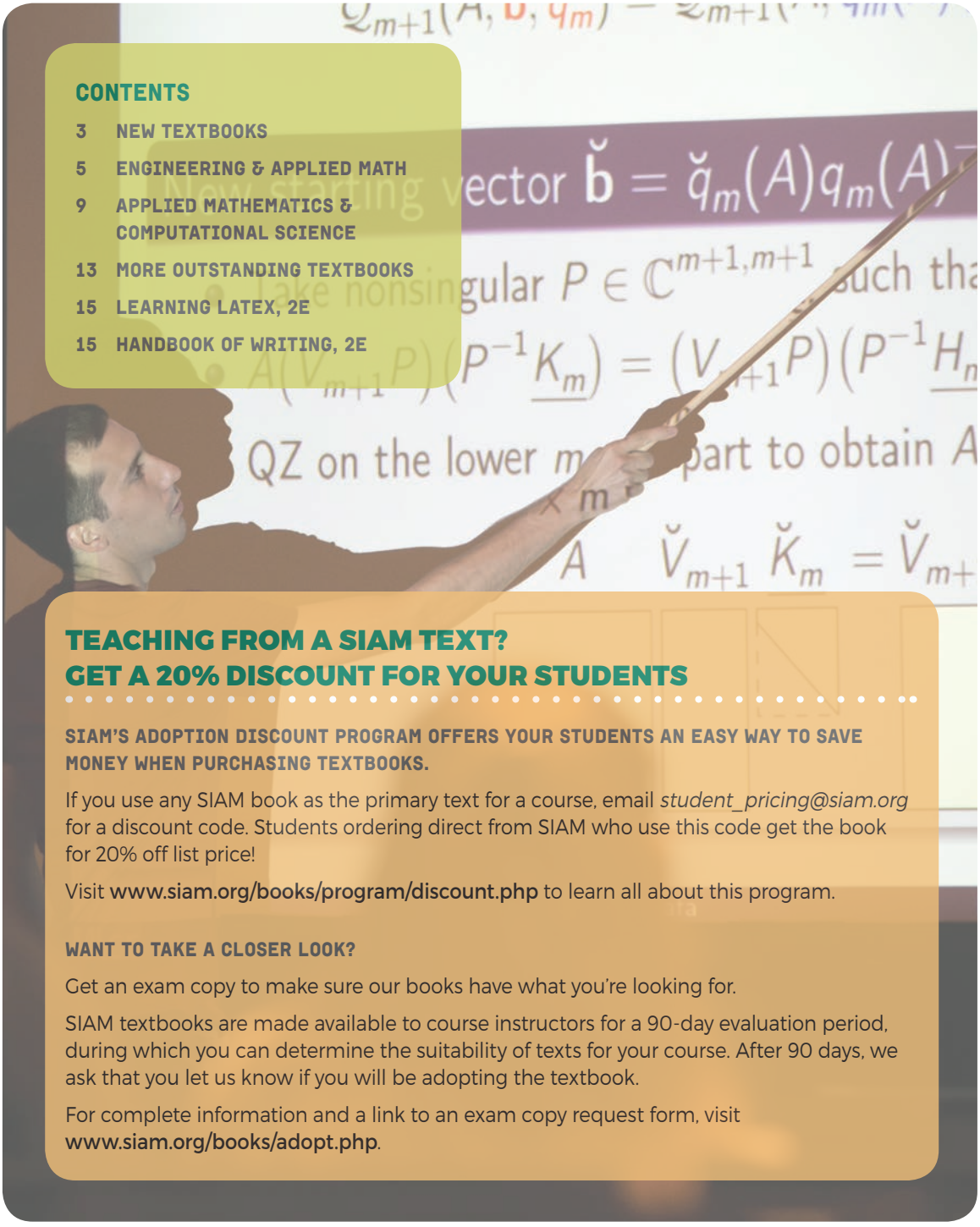

CONTENTS

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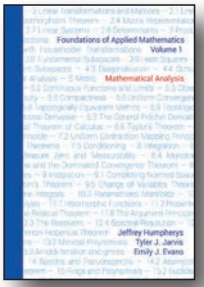
NEW TEXTBOOKS

FOUNDATIONS OF APPLIED MATHEMATICS
Volume 1: Mathematical Analysis

JEFFREY HUMPHERYS,
TYLER J. JARVIS,
AND EMILY J. EVANS



"Humpherys, Jarvis, and their collaborators are in the process of achieving something extraordinary: the creation of an entire curriculum of rigorous graduate-level applied mathematics with a four-volume series of first-rate books to support it."

— Lloyd N. Trefethen, University of Oxford

In addition to the standard topics, this text includes several key concepts of modern applied mathematical analysis that should be, but are not typically, included in advanced undergraduate and beginning graduate mathematics curricula. This material is the introductory foundation upon which algorithm analysis, optimization, probability, statistics, differential equations, machine learning, and control theory are built. When used in concert with the free supplemental lab materials, this text teaches students both the theory and the computational practice of modern mathematical analysis.

Subject areas: Linear algebra and matrix theory; real and complex analysis; numerical analysis; functional analysis

2017 · XX + 689 PP · HARDCOVER · 978-1-611974-89-8 · OT152
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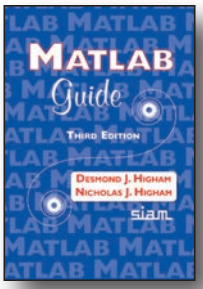

MATLAB GUIDE
Third Edition

DESMOND J. HIGHAM
AND NICHOLAS J. HIGHAM

This third edition of **MATLAB Guide** completely revises and updates the best-selling second edition and is more than 25 percent longer. It remains a lively, concise introduction to the most popular and important features of MATLAB and the Symbolic Math Toolbox. The new edition contains color figures throughout, includes pithy discussions of related topics in new "Asides" boxes that augment the text, has new chapters on the Parallel Computing Toolbox, object-oriented programming, graphs, and large data sets, covers important new MATLAB data types such as categorical arrays, string arrays, tall arrays, tables, and timetables, contains more on MATLAB workflow, including the Live Editor and unit tests, and fully reflects major updates to the MATLAB graphics system.

Used in these courses: Introduction to Numerical Computing (University of New Mexico); Chemical Engineering Control and Process Safety (Columbia University); Introduction to Numerical Analysis (North Carolina State University); and more.

2017 · XXVI + 476 PP · HARDCOVER · 978-1-611974-65-2 · OT150
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DATA ASSIMILATION
Methods, Algorithms, and Applications

MARK ASCH, MARC BOCQUET, MAËLLE NODET

Fundamentals of Algorithms 11

This textbook places data assimilation into the broader context of inverse problems and the theory, methods, and algorithms that are used for their solution. It provides a framework for, and insight into, the inverse problem nature of data assimilation, emphasizing "why" and not just "how." Methods and diagnostics are emphasized, enabling readers to readily apply them to their own field of study. The core audience is advanced undergraduate and early graduate students in applied mathematics, environmental sciences, and any domain that deals with inverse problems related to physical measurements.

Subject areas: Inverse problems; statistics; control and systems theory; simulation and modeling

2017 · XVIII + 306 PP · SOFTCOVER · 978-1-611974-53-9 · FA11
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DIFFERENTIAL DYNAMICAL SYSTEMS
Revised Edition

JAMES D. MEISS

Mathematical Modeling and Computation 22

Differential equations are the basis for models of any physical systems that exhibit smooth change. This book combines much of the material found in a traditional course on ordinary differential equations with an introduction to the more modern theory of dynamical systems. Applications of this theory to physics, biology, chemistry, and engineering are shown through examples in such areas as population modeling, fluid dynamics, electronics, and mechanics. Revisions include an expanded introduction to function spaces and additional exercises.

Used in these courses: Ordinary Differential Equations (Case Western Reserve University, Duke University); Dynamical Systems (Colorado State University, Rochester Institute of Technology); and more.

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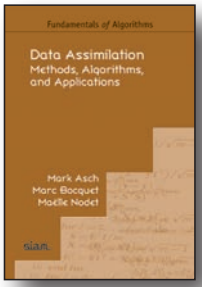

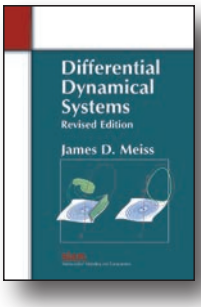

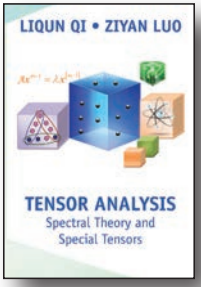

TENSOR ANALYSIS
Spectral Theory and Special Tensors

LIQUN QI AND ZIYAN LUO

In the last decade or so, many concepts and results in matrix theory—some of which are nontrivial—have been extended to tensors and have a wide range of applications (for example, spectral hypergraph theory, higher order Markov chains, polynomial optimization, magnetic resonance imaging, automatic control, and quantum entanglement problems). The authors provide a comprehensive discussion of this new theory of tensors. This book is the first text on three subject areas: spectral theory of tensors; the theory of special tensors, including nonnegative tensors, positive semidefinite tensors, completely positive tensors, and copositive tensors; and the spectral hypergraph theory via tensors.

Subject areas: Linear algebra and matrix theory; optimization theory; discrete mathematics

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DISCOURSE ON FOURIER SERIES

CORNELIUS LANCZOS

Classics in Applied Mathematics 76

"This is a radically different approach from modern mathematics texts, which tend to hide behind vast arrays of symbols and formalism. Lanczos, like Feynman, was so brilliant that even very complicated mathematics and physics seemed simple to him. His goal was to help the reader see how simple it all was, too."

— From the foreword by John Boyd

Originally published in 1966, this well-written and still-cited text covers Fourier analysis, a foundation of science and engineering. Many modern textbooks are filled with specialized terms and equations that may be confusing, but this book uses a friendly, conversational tone to clarify the material and engage the reader. The author meticulously develops the topic and uses 161 problems integrated into the text to walk the student down the simplest path to a solution.

Subject areas: Real and complex analysis; computational mathematics; numerical analysis

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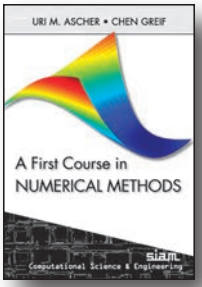

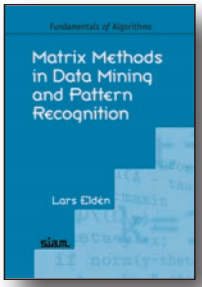

ENGINEERING & APPLIED MATH

A FIRST COURSE IN NUMERICAL METHODS

URI M. ASCHER AND CHEN GREIF

Computational Science and Engineering 7

This popular text is aimed at undergraduates and beginning graduate students who seek practical knowledge of modern techniques in scientific computing. It provides a variety of exercises within each chapter and review questions aimed at self-testing.

Used in these courses: Numerical Analysis and Differential Equations (Cornell University); Introduction to Numerical Analysis (Penn State University); Numerical Analysis and Computation (University of Southern California); and more.

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MATRIX METHODS IN DATA MINING AND PATTERN RECOGNITION

LARS ELDÉN

Fundamentals of Algorithms 4

This application-oriented book describes how modern matrix methods can be used to solve problems in data mining and pattern recognition. It is intended for undergraduate students who have previously taken an introductory scientific computing/numerical analysis course. Graduate students in various data mining and pattern recognition areas who need an introduction to linear algebra techniques will also find the book useful.

Used in these courses: Numerical Analysis (Florida State University); Applied Linear Algebra (University of California-Davis); Theory and Applications of Pattern Recognition (University of Wisconsin-Madison); and more.

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ATHANASIOS C. ANTOULAS

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— Petko Petkov, Mathematical Reviews

A comprehensive picture of model reduction, combining system theory with numerical linear algebra and computational considerations, this text addresses the issue of model reduction and the resulting trade-offs between accuracy and complexity. Special attention is given to numerical aspects, simulation questions, and practical applications.

Subject areas: Control and systems theory; dynamical systems; linear algebra and matrix theory; numerical analysis; ordinary differential equations; partial differential equations

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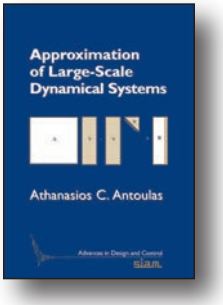

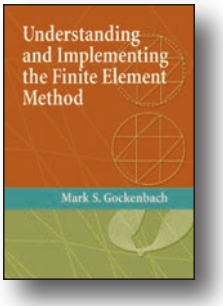

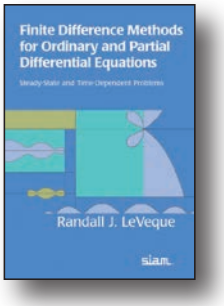

UNDERSTANDING AND IMPLEMENTING THE FINITE ELEMENT METHOD

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"Upon completion of this book a student or researcher would be well prepared to employ finite elements for an application problem or proceed to the cutting edge of research in finite element methods. The accuracy and the thoroughness of the book are excellent."

— Anthony Kearsley, research mathematician, National Institute of Standards and Technology

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— Prof. Samuel N. Stechmann, University of Wisconsin

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C. T. KELLEY

Frontiers in Applied Mathematics 16

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— W. Govaerts, *Mathematical Reviews*

This is an excellent textbook for mathematicians and engineers who want an insight into modern iterative methods for solving linear equations; for graduate-level introductory courses in nonlinear equations or iterative methods; or as source material for an introductory graduate course in numerical analysis.

Used in these courses: Iterative Methods for Systems of Equations (Georgia Institute of Technology); Iterative Methods for Linear and Nonlinear Systems (University of Pittsburgh); Numerical Analysis (Virginia Commonwealth University); and more.

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— Art Seddighi, *MAA Reviews*

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Used in these courses: Introduction to Scientific Computation (Boston College); Numerical Analysis and Differential Equations (Cornell University); Numerical Analysis (San Diego State University); and more.

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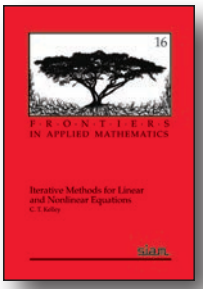

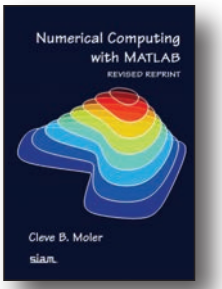

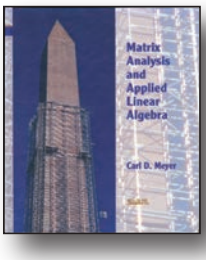

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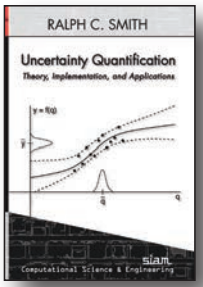

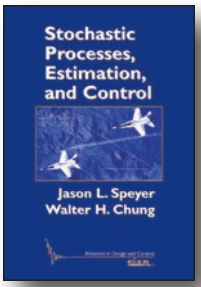

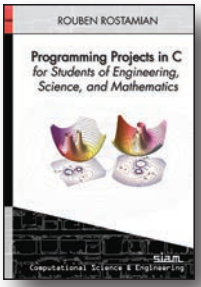

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Computational Science and Engineering 13

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— Karen Willcox, MIT

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JASON L. SPEYER AND WALTER H. CHUNG

Advances in Design and Control 17

The authors provide a comprehensive treatment of stochastic systems from the foundations of probability to stochastic optimal control. The book includes discussions on probability theory, stochastic processes, estimation, and stochastic control strategies. It is suitable for first-year graduate students in electrical, mechanical, chemical, and aerospace engineering specializing in systems and control. Students in computer science, economics, and possibly business will also find it useful.

Subject areas: Control and Systems Theory; Probability; Dynamical Systems; Optimization

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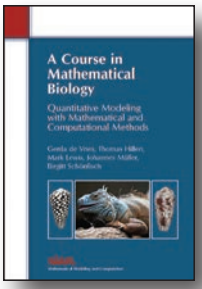
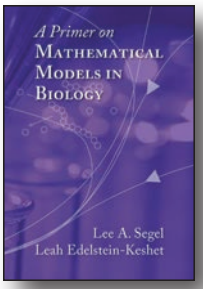
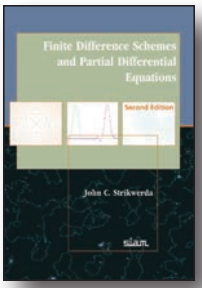
APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE

Biological Sciences







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Quantitative Modeling with Mathematical and Computational Methods

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Mathematical Modeling and Computation 12

"There really is not a book that is directly comparable. Students will be able to study any area of biology with a mathematical perspective. The projects and the introduction to computation are a real bonus."

— Fred Brauer, Department of Mathematics, University of British Columbia.

Used in these courses: Introduction to Mathematical Biology (Oregon State University); Mathematical Biology (Johns Hopkins University); Mathematical and Computational Modeling in Biology and Physics (University of Notre Dame); and more.

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This is one of the few texts in the field to not only present the theory of stability in a rigorous and clear manner but also to discuss the theory of initial-boundary value problems in relation to finite difference schemes. Fourier analysis is used throughout the book to give a unified treatment of many of the important ideas found in the first eleven chapters. The material on elliptic partial differential equations found in the later chapters provides an introduction that will enable students to progress to more advanced texts and to knowledgeably implement the basic methods.

Used in these courses: Numerical Solution of Partial Differential Equations (Florida State University); Advanced Numerical Methods (UCLA); Numerical Methods for PDEs (Virginia Polytechnic Institute); and more.

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— Prof. Ed Hall, University of Virginia

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Used in these courses: Nonlinear Functional Analysis (George Mason University); Selected Topics in Applied Mathematics (Indiana University)

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JAMES W. DEMMEL

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— Prof. James Lambers, University of Southern Mississippi

"This is an excellent graduate-level textbook for people who want to learn or teach the state of the art of numerical linear algebra. The book is very easy to use in the classroom since it provides pointers, in the book and on the author's home page, to lots of available MATLAB and LAPACK routines, and it has a large number of homework problems marked with Easy, Medium and Hard."

— Xia-Chuan Cai, Department of Computer Science, University of Colorado

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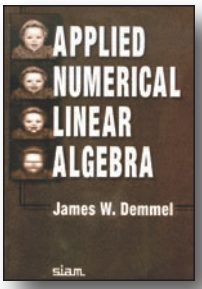

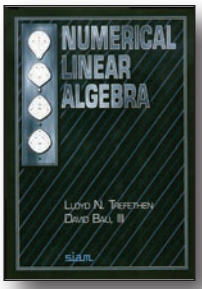

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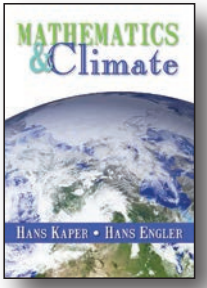

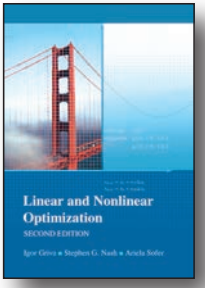

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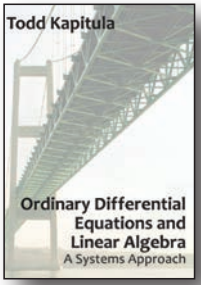

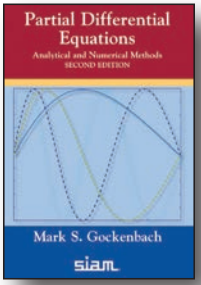

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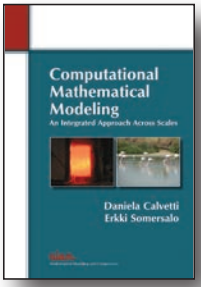

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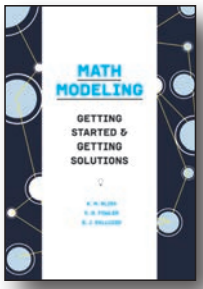

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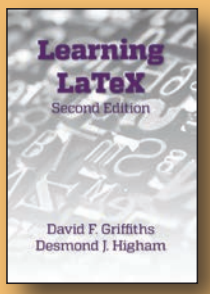

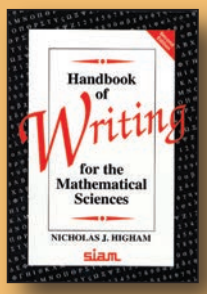

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