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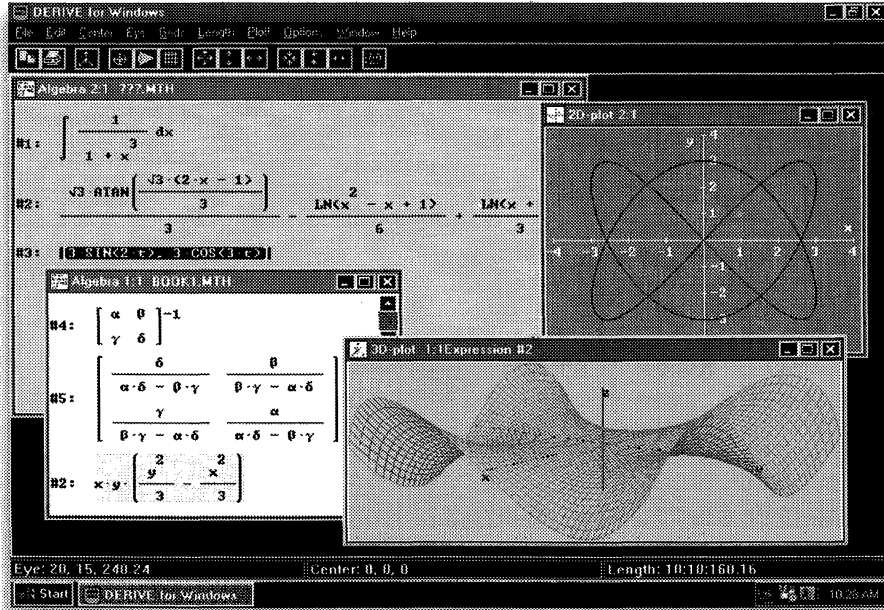
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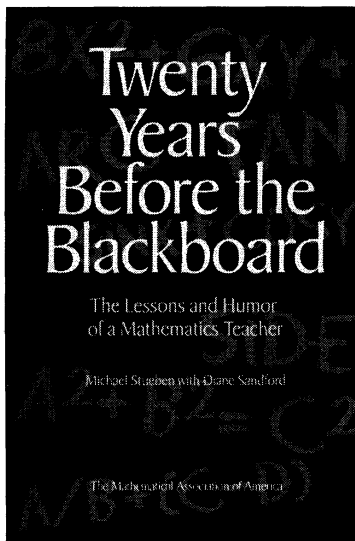
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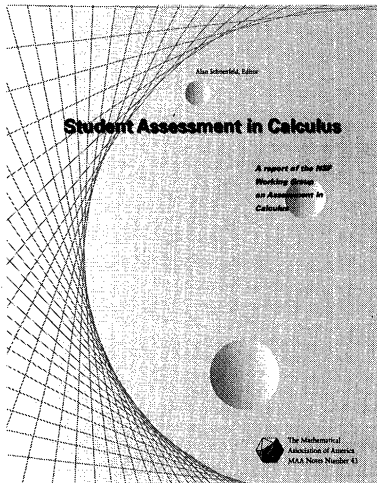
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# Student Assessment in Calculus

A Report of the NSF Working Group on Assessment in Calculus

ALAN SCHOENFELD, EDITOR

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If you teach calculus, you should read this book. If you want to know what mathematics your students understand, or if you want to know how to find out what they understand, this book contains essential information for you.

It doesn't matter whether you teach a reform or traditional course, whether you have large or small sections, or whether you use lectures or laboratories. The bottom line is the same: When all is said and done, what counts is what our students understand. And that's what *Student Assessment in Calculus* is about.

Over the last ten years calculus instruction has changed in numerous ways. Whether they were trying on new ideas or following the more traditional routes towards conceptual understanding, both individual faculty and departments needed to know if their instruction was effective. To help deal with that issue, the National Science Foundation brought together a Working Group of experts in students' mathematical thinking, in assessment, and in calculus reform. The goals of their work were to:

- develop a framework to tailor calculus instruction to the students' needs;

- establish an agenda for further research on student understanding;
- describe how to make use of a range of techniques to test what students know, such as multiple-choice tests or short essay questions, student portfolios and "clinical" interviews;
- summarize major goals of the reform movement and describe the challenges faced by those who are taking a closer look at how students learn;
- illustrate the ways in which calculus projects attempt (via exams, papers, projects, etc.) to find out what their students have learned.

This book is the result of those efforts. If you teach calculus, if you want to see examples of useful assessment techniques, or if you are interested in issues of how to measure student learning in mathematics, then there is a lot for you here.

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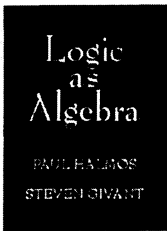
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This book is based on the notes of a course in logic given by Paul Halmos. This book retains the spirit and purpose of those notes, which was to show that logic can (and perhaps should) be viewed from an algebraic perspective. When so viewed, many of its principal notions are seen to be old friends, familiar algebraic notions that were “disguised” in logical clothing. Moreover, the connection between the principal theorems of the subject and well-known theorems in algebra becomes clearer. Even the proofs often gain in simplicity.

Propositional logic and monadic predicate calculus—predicate logic with a single quantifier—are the principal topics treated. The connections between logic and algebra are carefully explained. The key notions and the fundamental theorems are elucidated from both a logical and algebraic perspective. The final section gives a unique and illuminating algebraic treatment of the theory of syllogisms—perhaps the oldest branch of logic, and a subject that is neglected in most modern logic texts.

The presentation is aimed at a broad audience—mathematics amateurs, students, teachers, philosophers, linguists, computer scientists, engineers, and professional mathematicians. Whether the reader’s goal is a quick glimpse of modern logic or a more serious study of the subject, the book’s fresh approach will bring novel and illuminating insights to beginners and professionals alike. All that is required of the reader is an acquaintance with some of the basic notions encountered in a first course in modern algebra. In particular, no prior knowledge of logic is assumed. The book could serve equally well as a fire-side companion and as a course text.

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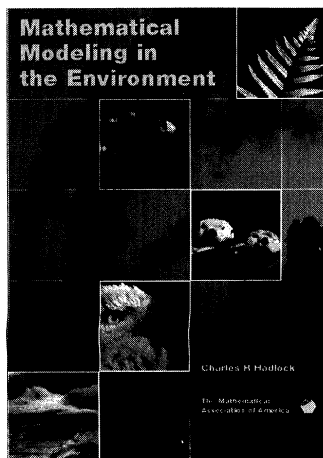
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An elementary course for a general audience could be based entirely on Part I, and a higher level mathematics, sci-

ence, or engineering course could move quickly to Part 2.

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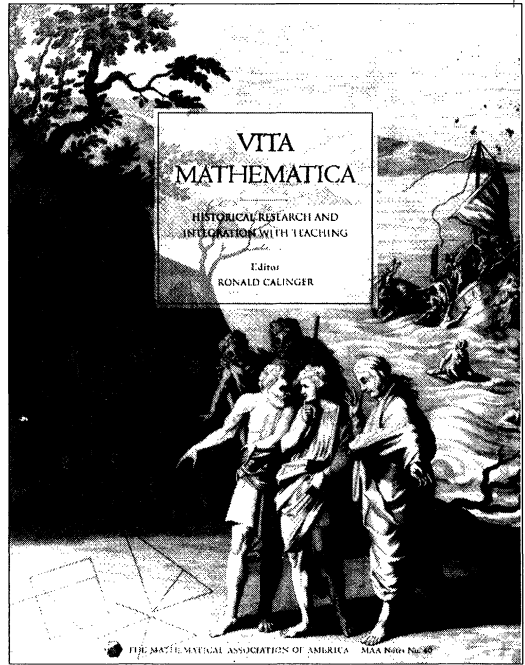
## Historical Research and Integration with Teaching

Ronald Calinger, Editor

The use of the history of mathematics in the teaching of mathematics at all levels is an idea whose time has come. To use history in the teaching of undergraduate mathematics, the instructor must be familiar with the history as well as the mathematics. *Vita Mathematica* will enable college teachers to learn the relevant history of various topics in the undergraduate curriculum and help them incorporate this history in their teaching.

For example, should calculus be approached from a geometric or an algebraic point of view? The book shows us how two important eighteenth century mathematicians, Colin Maclaurin and Joseph-Louis Lagrange, understood the calculus from these different standpoints and how their legacy is still important in teaching calculus today. We also learn why Lagrange's algebraic approach dominated teaching in Germany in the nineteenth century. Some of the reasons for this are related to the appropriate foundations of the calculus, and so the book traces the ancient history of one of the possible foundations, the concept of indivisibles. Even though we generally do not use this concept formally today, many ideas for a heuristic approach to the calculus can be developed out of his study.

*Vita Mathematica* contains numerous other articles dealing with calculus, with algebra, com-



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# The Lighter Side of Mathematics

Proceedings of the Eugène Strens Memorial Conference on Recreational Mathematics and its History

Richard K. Guy and Robert E. Woodrow, Editors

*The level of exposition is high, and the fun infectious. The reader can find routes to serious mathematics, such as hyperbolic geometry, fractals, group theory, and number theory, all beginning with a delightful puzzle. A sparkling addition for any library where the lover of mathematics at any level comes for support.*

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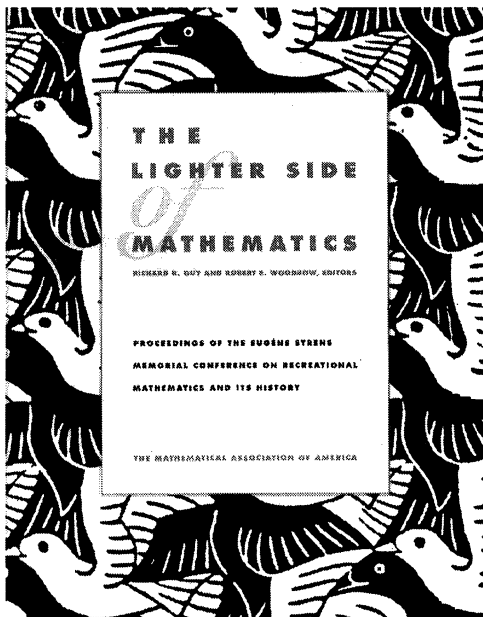
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—Martin Gardner, American Scientist

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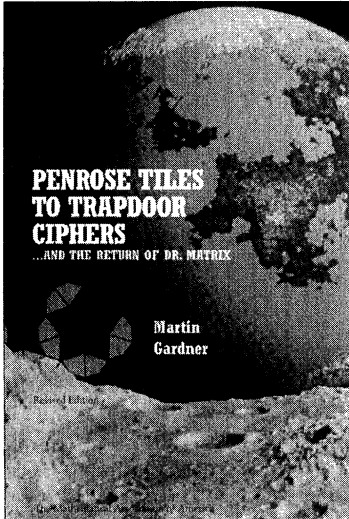


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Included here are chapters on Conway's surreal numbers, Mandelbrot's fractals, and Smullyan's logic puzzles, as well as puzzlers dealing with hyperbolas, negative numbers, pool-ball triangles, and Penrose tiles and trapdoor ciphers. And of course, you can read of the return of Dr. Irvine Joshua Matrix, (famed numerologist and CIA operative), one of Martin Gardner's oldest fictional friends.

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—American Scientist

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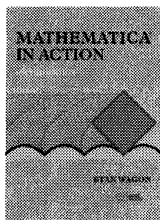
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