BOOK REVIEWS

John Grant McLoughlin

Calculus Gems: Brief Lives and Memorable Mathematics
By George F. Simmons, Mathematical Association of America, 2007

Reviewed by Robert D. Poodiack, Norwich University, Northfield, VT, USA

This recent reissue of Simmons' 1992 book is a wonderful source of tidbits and examples for teachers and professors of calculus. However, many teachers may end up using the first part of the book more than the second.

In the introduction to Calculus Gems, Simmons talks about an impulse to "humanize" calculus in order to bring students closer to the subject. The 33 biographies that comprise the first part of the book accomplish his goal and entice novice readers and professors alike. Many current calculus books give early motivation by describing how Archimedes solved the area problem (how to calculate the area of a non-standard shaped region) and the tangent problem (how to compute the slope of a line tangent to a curve, given only the point of tangency) by using what we would call limiting processes.

Part A of Simmons' book expands the motivational material into a full history of calculus. Simmons begins with Thales' work on geometry and proving theorems and finishes with Weierstrass' work on the foundations of calculus, a period of 2400 years. The life stories are fascinating – this volume would make a wonderful history book by itself – but even better is the way Simmons weaves the development of calculus concepts through the biographies. Most students know that Newton and Leibniz are the fathers of calculus, but they'll be amazed how far back some of their basic concepts date. As much as our students want to blame 17th century mathematicians for their woes, Leibniz and Newton were only rephrasing problems solved 18 centuries before by Archimedes. Students who give these stories a chance will find much to enjoy, not only in the writing but also in the parallels to their experience. Hey, these guys all had trouble with this stuff too!

The second part of the book consists of "Memorable Mathematics," expansions upon topics discussed in Part A. Simmons intends this section to follow along with a typical calculus curriculum. (Six sections even have attached problems for students.) He says in the introduction that "Many of my students have found these 'nuggets' interesting and eye-opening." That they are, but I'm guessing that Simmons had some pretty advanced students. Certainly many topics that turn up in calculus books are present. The sections that include sequences and series, the cycloid, or integration are all standard material, but are presented in a zestful, easy-to-read manner. However, calculus professors may want to relegate some of the number-theoretic material – proofs of the transcendence of π and e for instance – more to the "mention in passing" category. These topics are also presented quite clearly,
and the transcendence proofs are indeed based on calculus – quite different from ones I had seen before.

We note that this book is a straight reprint of the 1992 original. The only updating was to Simmons’ biography. The chapter on Fermat reveals that his Last Theorem, alas, has not yet been proved.

Calculus Gems stands as an excellent historical study for calculus students and teachers alike that divides down the middle. While the students will enjoy the biographies in Part A, the faculty may get more from the memorable mathematics in Part B. Calculus Gems should start many good classroom conversations about calculus.

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From Zero to Infinity: What Makes Numbers Interesting (Fiftieth Anniversary Edition)

By Constance Reid, published by A.K. Peters, 2006
Reviewed by John Grant McLoughlin, University of New Brunswick, Fredericton, NB

The 2006 publication of the fiftieth anniversary of this 1955 classic gives rise to another discussion of interesting numbers. Constance Reid is the sister of Julia Robinson (the logician noted for her work on Hilbert’s tenth problem). A phone call from Julia in 1952 inspired the writing. Julia’s husband, Raphael M. Robinson, had discovered more perfect numbers.

The book has 12 chapters. The initial chapter, Chapter 0, is titled Zero, Chapter 1 is titled One, and so forth until Chapter 9, titled Nine. The other two chapters are Euler’s Number and Aleph-Zero. The first ten chapters are each ten to fifteen pages in length, whereas, the two concluding chapters are each twenty pages in length. The chapter contents appear thematic as with binary arithmetic (Chapter 2) or perfect numbers (Chapter 6), for example. A curious feature is the inclusion of a challenge (with answers written upside down) at the end of each chapter. Some challenges enriched the appreciation of the numbers; however, others seemed to be forced by the need for consistency in style. An unfortunate error is the mismatch between page numbers of chapters in the Table of Contents and those actually in the book.

References to number theory, modular arithmetic, or particular mathematical terms are sprinkled throughout the book. Even so, the first ten chapters of the book are accessible to high school students. Familiarity with undergraduate mathematics would enrich the value of the two concluding chapters in which calculus, series, and infinite sets figure prominently. A class at any level could avail of the book as a source of learning. Chapters can serve as independent studies or starting points for discussion. Chapter 0 is a good place to start for those who have taken this special number for granted.

Overall, I recommend this book to those who wish to see more of the beauty in mathematics. Much can be learned through the surprises and rich connections offered in this gem.