

BOOK REVIEW

Handbook of integration, by Daniel Zwillinger. Jones & Bartlett Publishers, Boston, MA, 1992, xvi+367 pp., \$49.95. ISBN 0-86720-293-9

There are now many sources for possible solutions to the diverse collection of integration problems that arise in mathematics. We have the traditional tables of integrals, books on the theory of integration, and books on numerical methods. We also have access to numerical software libraries and symbolic mathematics computing systems. In addition, we also have a large variety of methods that are scattered through books and papers on pure and applied mathematics. This book is an attempt to provide a comprehensive survey of these integration methods. It is a compilation of methods that the author began collecting when he was a graduate student.

The book is organized as a collection of eighty-three short sections. These are somewhat loosely arranged under the six chapter headings: Applications, Concepts and definitions, Exact analytical methods, Approximate analytical methods, Numerical methods concepts, and Numerical methods techniques. Each section usually begins with short entries under the categories: applicable to, yields, and idea. These entries are followed by more extensive discussion under the categories: procedure, examples, notes, and references. The references are extensive and up to date. For example, §50, entitled “Stationary Phase”, begins:

Applicable to

Integrals of the form $I(\lambda) = \int_a^b g(x)e^{i\lambda f(x)} dx$, where $f(x)$ is a real-valued function.

Yields

An asymptotic approximation when $\lambda \gg 1$.

Idea

For $\lambda \rightarrow \infty$ the value of $I(\lambda)$ is dominated by the contributions at those points where $f(x)$ is a local minimum.

The section continues with a half-page description of the procedure and a half-page example. This is followed by one and one-half pages of notes and ten references. The references range from a 1918 paper by G. N. Watson to a 1991 paper by J. P. McClure and R. Wong and include three books. The section is typical. The mathematics is clear and concise. There is enough information for the reader who wants a short discussion of the topic of interest, and there are good references for someone who wants more detail.

The book is clearly a reference book. It is shorter than what one might expect for a book with a title *Handbook of integration*, but I suspect that most integration

problems in applied mathematics would have at least the beginning of a solution outlined in this book. People who have a variety of applied integration problems should find this book to be a valuable reference that is easy to use. I would like to have seen more information about integrals that arise in statistics. There is a brief mention of the one-dimensional normal distribution function but little else. Other readers might also find some of their favorite topics missing, but they are also likely to find plenty of new material and references. There is no other book that provides such a broad and up-to-date survey of integration methods.

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