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BULLETIN (New Series) OF THE
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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 $\lambda \to \infty$ 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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Real reductive groups II, by Nolan R. Wallach. Academic Press, New York, 1992, xiv+454 pp., $105.00. ISBN 0-12-732961-7

The principal goal of harmonic analysis of locally compact groups is that of understanding group actions on various function spaces. As examples, let X be a pseudo-Riemannian manifold and G a group of isometries of X. There is then a natural action of G on $L^2(X)$. Assume that the Laplace-Beltrami operator ω on X is selfadjoint. In this case the group will preserve the spectral decomposition of the Laplace-Beltrami operator; further, in the case that G acts transitively on X, any G-invariant subspace will be left invariant by ω. Hence, the decomposition of G on $L^2(X)$ is intimately related to the spectral problem for ω. Note that in this setting if we take G to be the group $O(n, \mathbb{R})$ of real $n \times n$ orthogonal matrices and $X = S^{n-1}$ to be the unit sphere in $\mathbb{R}^n$, we are led to classical Fourier series when $n = 2$ and to spherical harmonics when $n = 3$.

In the first volume of this (to date) two-volume series, the author introduced a class of real reductive Lie groups, investigated their structure, and parametrized a large class of their representations (homomorphisms of the group into the bounded operators of some topological vector space). The goal of the two-volume set is the proof of the Harish-Chandra Plancherel theorem for reductive Lie groups. This theorem has many guises; however, for this exposition it is best thought of as showing that any "rapidly decreasing" function can be recovered from its Fourier transform. In this form the Plancherel theorem contrasts sharply with the "abstract Plancherel theorem", which is presented in Chapter 14 of Volume II. The abstract Plancherel Theorem states that if we let G be a reductive Lie group of the type defined in Volume I and if G acts on the $L^2(G)$ via any of the natural actions, then this (unitary) representation can be decomposed into a direct integral over the equivalence classes of irreducible