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## REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

The numbers in brackets are assigned according to the American Mathematical Society classification scheme. The 2000 Mathematics Subject Classification can be found in print starting with the 1999 annual index of *Mathematical Reviews*. The classifications are also accessible from `www.ams.org/msc/`.

**7[41A60, 33-02, 33Cxx, 30E15]**—*Asymptotics and Mellin–Barnes integrals*, by R. B. Pari and D. Kaminski, Encylopedia of Mathematics and Its Applications, Volume 85, Cambridge University Press, New York, NY, 2001, xvi + 422 pp., 24 cm, hardcover, $95.00

This book is a very welcome addition to the presently most interesting books on asymptotics by Olver [1] and Wong [2]. First an introduction to asymptotics of integrals is given and then the special features of Mellin–Barnes integrals are considered. These integrals have integrands with rational functions of gamma functions, and arise in the inversion of Mellin transforms. Many special functions of hypergeometric type, and integrals or products of these functions, can be written as such integrals. Other series and integrals can be transformed into these forms also, as is done, for example, for the generalised Euler–Jacobi series $S_p(a) = \sum_{n=0}^{\infty} \exp(-an^p)$, $p0$ of which the asymptotic behavior for $a \downarrow 0$ is studied.

Much attention is paid to topics that have recently given new insights into the theory of asymptotic expansions, such as the Stokes phenomenon (the sudden change of certain constants in asymptotic approximations), exponential asymptotics (the role of exponentially small terms in asymptotic approximations), and to hyperasymptotics (the expansion of remainders in asymptotic approximations at an optimal point in the expansion).

Other topics are expansions for the Riemann zeta function on the critical line, the Pearcey integral (a two-variable generalization of the classical Airy function), and applications to number-theoretic examples, solving differential, difference and integral equations. There is a chapter on multiple Mellin–Barnes integrals, with applications to double integrals of Laplace type (and of higher dimension), with extensive discussion of the role of the Newton diagram for investigating phase functions with interior, boundary and exterior critical points. Biographies of Mellin and Barnes are also included.

The book should be accessible to readers with a solid undergraduate background in functions of a single complex variable. I can highly recommend this book to anyone interested in asymptotics of integrals or in asymptotic methods for special functions.

### References

[1] F. W. J. Olver, *Asymptotics and special functions*, Reprint of the 1974 original [Academic Press, New York]. AKP Classics, A. K. Peters, Ltd., Wellesley, MA, 1997. MR **97i:**41001
[2] R. Wong, *Asymptotic approximations of integrals*. Corrected reprint of the 1989 original. Classics in Applied Mathematics, **34**, SIAM, Philadelphia, PA, 2001. MR **2002f:**41023

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