

$$K_\nu(z) = \sqrt{\frac{\pi}{2z}} e^{-z} \sum_{r=0}^{\infty} \frac{\Gamma(\nu+r+1/2)}{r! \Gamma(\nu-r+1/2)} (2z)^{-r}$$

is a divergent asymptotic series

$$= \sqrt{\frac{\pi}{2z}} e^{-z} \left[1 + \frac{(\nu+1/2)(\nu-1/2)}{2z} + \frac{(\nu+3/2)(\nu+1/2)(\nu-1/2)(\nu-3/2)}{2! (2z)^2} + \dots \right]$$

Series terminates for $\nu = \pm \frac{1}{2}, \pm \frac{3}{2}, \dots$

$$x = \frac{1}{z} \quad \rightarrow \quad \frac{d}{dz} = -x^2 \frac{d}{dx} \quad \frac{d^2}{dz^2} = 2x^3 \frac{d}{dx} + x^4 \frac{d^2}{dx^2}$$

$$R''(z) + \frac{1}{z} R'(z) - \left(1 + \frac{\nu^2}{z^2}\right) R = 0 \quad \rightarrow \quad x^4 R''(x) + x^3 R'(x) - (1 + \nu^2 x^2) R(x) = 0$$

$$R''(x) + \frac{1}{x} R'(x) - \frac{1}{x^2} \left(\nu^2 + \frac{1}{x^2} \right) R(x) = 0$$

$$\lim_{x \rightarrow 0} (x-0)^2 \left[-\frac{1}{x^2} \left(\nu^2 + \frac{1}{x^2} \right) \right] = -\infty \quad \rightarrow \quad z = \infty \text{ is an essential singularity}$$

$\therefore$ No convergent series solution about $z = \infty$.

Asymptotic Expansions Asymptotic Expansions

A. Erdélyi



Asymptotic Expansions Asymptotic Expansions:

Asymptotic Expansions of Integrals Norman Bleistein, Richard A. Handelsman, 1975 Coherent systematic coverage of standard methods integration by parts Watson's lemma Laplace's method stationary phase and steepest descents Also includes Mellin transform method and less elementary aspects of the method of steepest descents Abundant exercises 1975 edition *Asymptotic Expansions* E. T. Copson, Edward Thomas Copson, 2004-06-03 Asymptotic representation of a function of great importance in many branches of pure and applied mathematics **Asymptotic Expansions: Their Derivation and Interpretation** Robert B. Dingle, 1973 **Asymptotic Expansions** A. Erdélyi, 2012-04-27 Various methods for asymptotic evaluation of integrals containing a large parameter and solutions of ordinary linear differential equations by means of asymptotic expansion *Asymptotic Expansions for Ordinary Differential Equations* Wolfgang Wasow, 2018-03-21 This outstanding text concentrates on the mathematical ideas underlying various asymptotic methods for ordinary differential equations that lead to full infinite expansions A book of great value Mathematical Reviews 1976 revised edition *Matched Asymptotic Expansions and Singular Perturbations*, 2011-08-26 Matched Asymptotic Expansions and Singular Perturbations **Asymptotic Expansions** E. T. Copson, 1967 **Asymptotic Approximations of Integrals** R. Wong, 2001-08-01 This classic text remains the most up to date book to deal with asymptotic approximations of integrals All results discussed are proved rigorously and many of the approximation formulas are accompanied by error bounds Included is a thorough discussion on multidimensional integrals with references provided plus the distributional method not available elsewhere [Asymptotic Expansions](#) Johannes Gualtherus Corput, 1951 **Asymptotic Expansions for Pseudodifferential Operators on Bounded Domains** Harold Widom, 2006-11-14 *Normal Approximation and Asymptotic Expansions* Rabi N. Bhattacharya, R. Ranga Rao, 2010-11-11 Fourier analysis **Composite Asymptotic Expansions** Augustin Fruchard, Reinhard Schafke, 2012-12-15 The purpose of these lecture notes is to develop a theory of asymptotic expansions for functions involving two variables while at the same time using functions involving one variable and functions of the quotient of these two variables Such composite asymptotic expansions CAsEs are particularly well suited to describing solutions of singularly perturbed ordinary differential equations near turning points CAsEs imply inner and outer expansions near turning points Thus our approach is closely related to the method of matched asymptotic expansions CAsEs offer two unique advantages however First they provide uniform expansions near a turning point and away from it Second a Gevrey version of CAsEs is available and detailed in the lecture notes Three problems are presented in which CAsEs are useful The first application concerns canard solutions near a multiple turning point The second application concerns so called non smooth or angular canard solutions Finally an Ackerberg O Malley resonance problem is solved *Asymptotic Expansions: Fundamental theorems of asymptotics* Johannes Gualtherus van der Corput, 1954 [Asymptotic Analysis](#) Ricardo Estrada, Ram P. Kanwal, 2012 1 Basic Results in Asymptotics 1 1 Introduction 1 2 Order Symbols 1 3 Asymptotic

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Nonarchimedean Fields and Asymptotic Expansions A. H. Lightstone, Abraham Robinson, 2016-06-03 North Holland Mathematical Library Volume 13 Nonarchimedean Fields and Asymptotic Expansions focuses on the connection between nonarchimedean systems and the orders of infinity and smallness that are related with the asymptotic behavior of a function The publication first explains nonarchimedean fields and nonstandard analysis Discussions focus on the method of mathematical logic ultrapower construction principles of permanence internal functions many sorted structures nonarchimedean fields and groups and fields with evaluation The text then discusses the Euler

Maclaurin expansions and the formal concept of asymptotic expansions Topics include a generalized criterion for asymptotic expansions asymptotic power series Watson's Lemma asymptotic sequences and the Euler-Maclaurin formula The manuscript examines Popken space including asymptotically finite functions convergence norm algebraic properties of the norm and Popken's description of the norm The text is a dependable reference for mathematicians and researchers interested in nonarchimedean fields and asymptotic expansions **Asymptotic Expansions** Johannes Gualtherus Corput, 1951

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