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# Multiple Scale and Singular Perturbation Methods



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**S Ashworth**



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**Multiple Scale and Singular Perturbation Methods** J.K. Kevorkian, J.D. Cole, 2012-12-06 This book is a revised and updated version including a substantial portion of new material of our text *Perturbation Methods in Applied Mathematics* Springer Verlag 1981 We present the material at a level that assumes some familiarity with the basics of ordinary and partial differential equations Some of the more advanced ideas are reviewed as needed therefore this book can serve as a text in either an advanced undergraduate course or a graduate level course on the subject Perturbation methods first used by astronomers to predict the effects of small disturbances on the nominal motions of celestial bodies have now become widely used analytical tools in virtually all branches of science A problem lends itself to perturbation analysis if it is close to a simpler problem that can be solved exactly Typically this closeness is measured by the occurrence of a small dimensionless parameter  $\epsilon$  in the governing system consisting of differential equations and boundary conditions so that for  $\epsilon \rightarrow 0$  the resulting system is exactly solvable The main mathematical tool used is asymptotic expansion with respect to a suitable asymptotic sequence of functions of  $\epsilon$  In a regular perturbation problem a straightforward procedure leads to a system of differential equations and boundary conditions for each term in the asymptotic expansion This system can be solved recursively and the accuracy of the result improves as  $\epsilon$  gets smaller for all values of the independent variables throughout the domain of interest We discuss regular perturbation problems in the first chapter

**Multiple Scale and Singular Perturbation Methods** J K Kevorkian, J D Cole, 1996-05-15 This book is a revised and updated version including a substantial portion of new material of the authors widely acclaimed earlier text *Perturbation Methods in Applied Mathematics* A new chapter dealing with regular expansions has been added the discussion of layer type singular perturbations has been revised and the coverage of multiple scale and averaging methods has been significantly expanded to reflect recent advances and viewpoints The result is a comprehensive account of the various perturbation techniques currently used in the sciences and engineering and is suitable for a graduate text as well as a reference work on the subject [Multiple Scale and Singular Perturbation Methods](#) J. Kevorkian, J. D. Cole, 1996-06-30

**Analyzing Multiscale Phenomena Using Singular Perturbation Methods** Jane Cronin, Robert E. O'Malley, American Mathematical Society, To understand multiscale phenomena it is essential to employ asymptotic methods to construct approximate solutions and to design effective computational algorithms This volume consists of articles based on the AMS Short Course in Singular Perturbations held at the annual Joint Mathematics Meetings in Baltimore MD Leading experts discussed the following topics which they expand upon in the book boundary layer theory matched expansions multiple scales geometric theory computational techniques and applications in physiology and dynamic metastability Readers will find that this text offers an up to date survey of this important field with numerous references to the current literature both pure and applied

**Rigorous Analysis of Multiple-scale Method on Some Singular Perturbation Problems** [?], 2002 *Asymptotic Multiple Scale Method in*

*Time Domain* Jan Awrejcewicz, Roman Starosta, Grażyna Sypniewska-Kamińska, 2022-05-10 This book offers up novel research which uses analytical approaches to explore nonlinear features exhibited by various dynamic processes Relevant to disciplines across engineering and physics the asymptotic method combined with the multiple scale method is shown to be an efficient and intuitive way to approach mechanics Beginning with new material on the development of cutting edge asymptotic methods and multiple scale methods the book introduces this method in time domain and provides examples of vibrations of systems Clearly written throughout it uses innovative graphics to exemplify complex concepts such as nonlinear stationary and nonstationary processes various resonances and jump pull in phenomena It also demonstrates the simplification of problems through using mathematical modelling by employing the use of limiting phase trajectories to quantify nonlinear phenomena Particularly relevant to structural mechanics in rods cables beams plates and shells as well as mechanical objects commonly found in everyday devices such as mobile phones and cameras the book shows how each system is modelled and how it behaves under various conditions It will be of interest to engineers and professionals in mechanical engineering and structural engineering alongside those interested in vibrations and dynamics It will also be useful to those studying engineering maths and physics

Singular Perturbation Theory R.S. Johnson, 2005-12-28 The importance of mathematics in the study of problems arising from the real world and the increasing success with which it has been used to model situations ranging from the purely deterministic to the stochastic is well established The purpose of the set of volumes to which the present one belongs is to make available authoritative up to date and self contained accounts of some of the most important and useful of these analytical approaches and techniques Each volume provides a detailed introduction to a specific subject area of current importance that is summarized below and then goes beyond this by reviewing recent contributions and so serving as a valuable reference source The progress in applicable mathematics has been brought about by the extension and development of many important analytical approaches and techniques in areas both old and new frequently aided by the use of computers without which the solution of realistic problems would otherwise have been impossible

*Perturbations* James A. Murdock, 1999-01-01 This book gives a thorough introduction to both regular and singular perturbation methods for algebraic and differential equations

Special Functions - Proceedings Of The International Workshop Charles F Dunkl, Mourad E H Ismail, Roderick S C Wong, 2000-10-27 Special functions and q series are currently very active areas of research which overlap with many other areas of mathematics such as representation theory classical and quantum groups affine Lie algebras number theory harmonic analysis and mathematical physics This book presents the state of the art of the subject and its applications

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of the art of the subject and its applications     *Applied Mechanics Reviews* ,1996     **Singular Perturbations in Systems and Control** Kokotovic Petar V,Michael A. Soderstrand,Hassan K. Khalil,IEEE Control Systems Society,1986 Very Good No Highlights or Markup all pages are intact     **Plasticity** S. Nemat-Nasser,2004-11-29 Publisher Description

**Mathematical Tools for Physicists** Michael Grinfeld,2015-01-12 The new edition is significantly updated and expanded This unique collection of review articles ranging from fundamental concepts up to latest applications contains individual contributions written by renowned experts in the relevant fields Much attention is paid to ensuring fast access to the information with each carefully reviewed article featuring cross referencing references to the most relevant publications in the field and suggestions for further reading both introductory as well as more specialized While the chapters on group theory integral transforms Monte Carlo methods numerical analysis perturbation theory and special functions are thoroughly rewritten completely new content includes sections on commutative algebra computational algebraic topology differential geometry dynamical systems functional analysis graph and network theory PDEs of mathematical physics probability theory stochastic differential equations and variational methods     *Dynamics of Continuous, Discrete & Impulsive Systems* ,2002

**Perturbation Methods in the Computer Age** David C. Wilcox,1995     *A New Renormalization Method for the Asymptotic Solution of Multiple Scale Singular Perturbation Problems* Blessing Mudavanhu,2002     *Nonlinear Zero-sum Differential Game Analysis by Singular Perturbation Methods* ,1982     **Systems Engineering for Power** United States. Department of Energy. Office of Electric Energy Systems,1980-08     **Proceedings of the 1985 American Control Conference** ,1985

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