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# **Methods in Nonlinear Integral Equations**

**Radu Precup**

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**Springer-Science+Business Media, B.V.**

# Nonlinear Integral Equations

**Philip M. Anselone**



## **Nonlinear Integral Equations:**

**Nonlinear Integral Equations** Philip M. Anselone, 1964     Methods in Nonlinear Integral Equations R Precup, 2002-08-31 Methods in Nonlinear Integral Equations presents several extremely fruitful methods for the analysis of systems and nonlinear integral equations They include fixed point methods the Schauder and Leray Schauder principles variational methods direct variational methods and mountain pass theorems and iterative methods the discrete continuation principle upper and lower solutions techniques Newton's method and the generalized quasilinearization method Many important applications for several classes of integral equations and in particular for initial and boundary value problems are presented to complement the theory Special attention is paid to the existence and localization of solutions in bounded domains such as balls and order intervals The presentation is essentially self contained and leads the reader from classical concepts to current ideas and methods of nonlinear analysis

**Introduction to Nonlinear Differential and Integral Equations** Harold Thayer Davis, 1960     On a Class of Nonlinear Integral Equations Zeev Nehari, 1959     **Linear and Nonlinear Integral Equations** Abdul-Majid Wazwaz, 2011-11-24 Linear and Nonlinear Integral Equations Methods and Applications is a self contained book divided into two parts Part I offers a comprehensive and systematic treatment of linear integral equations of the first and second kinds The text brings together newly developed methods to reinforce and complement the existing procedures for solving linear integral equations The Volterra integral and integro differential equations the Fredholm integral and integro differential equations the Volterra Fredholm integral equations singular and weakly singular integral equations and systems of these equations are handled in this part by using many different computational schemes Selected worked through examples and exercises will guide readers through the text Part II provides an extensive exposition on the nonlinear integral equations and their varied applications presenting in an accessible manner a systematic treatment of ill posed Fredholm problems bifurcation points and singular points Selected applications are also investigated by using the powerful Pad approximants This book is intended for scholars and researchers in the fields of physics applied mathematics and engineering It can also be used as a text for advanced undergraduate and graduate students in applied mathematics science and engineering and related fields Dr Abdul Majid Wazwaz is a Professor of Mathematics at Saint Xavier University in Chicago Illinois USA     Nonlinear Volterra Integral Equations Richard K. Miller, 1971     Nonlinear Integral Equations in Abstract Spaces Dajun Guo, V. Lakshmikantham, Xinzhi Liu, 2013-11-22 Many problems arising in the physical sciences engineering biology and applied mathematics lead to mathematical models described by nonlinear integral equations in abstract spaces The theory of nonlinear integral equations in abstract spaces is a fast growing field with important applications to a number of areas of analysis as well as other branches of science This book is devoted to a comprehensive treatment of nonlinear integral equations in abstract spaces It is the first book that is dedicated to a systematic development of this subject and it includes the developments during recent years Chapter 1

introduces some basic results in analysis which will be used in later chapters Chapter 2 which is a main portion of this book deals with nonlinear integral equations in Banach spaces including equations of Fredholm type of Volterra type and equations of Hammerstein type Some applications to nonlinear differential equations in Banach spaces are given We also discuss an integral equation modelling infectious disease as a typical application In Chapter 3 we investigate the first order and second order nonlinear integro differential equations in Banach spaces including equations of Volterra type and equations of mixed type Chapter 4 is devoted to nonlinear impulsive integral equations in Banach spaces and their applications to nonlinear impulsive differential equations in Banach spaces

*Nonlinear Integral Equations and Inclusions* Ravi P. Agarwal, Maria Meehan, Donal O'Regan, 2001

*Introduction to Integral Equations with Applications* Abdul J. Jerri, 1999-09-03 From the reviews of the First Edition Extremely clear self contained text offers to a wide class of readers the theoretical foundations and the modern numerical methods of the theory of linear integral equations *Revue Roumaine de Mathematiques Pures et Appliquées* Abdul Jerri has revised his highly applied book to make it even more useful for scientists and engineers as well as mathematicians Covering the fundamental ideas and techniques at a level accessible to anyone with a solid undergraduate background in calculus and differential equations Dr Jerri clearly demonstrates how to use integral equations to solve real world engineering and physics problems This edition provides precise guidelines to the basic methods of solutions details more varied numerical methods and substantially boosts the total of practical examples and exercises Plus it features added emphasis on the basic theorems for the existence and uniqueness of solutions of integral equations and points out the interrelation between differentiation and integration Other features include A new section on integral equations in higher dimensions An improved presentation of the Laplace and Fourier transforms A new detailed section for Fredholm integral equations of the first kind A new chapter covering the basic higher quadrature numerical integration rules A concise introduction to linear and nonlinear integral equations Clear examples of singular integral equations and their solutions A student's solutions manual available directly from the author

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*Novel Methods for Solving Linear and Nonlinear Integral Equations* Santanu Saha Ray, Prakash Kumar Sahu, 2018-12-07 This book deals with the numerical solution of integral equations based on approximation of functions and the authors apply wavelet approximation to the unknown function of integral equations The book's goal is to categorize the selected methods and assess their accuracy and efficiency

**Existence Theory for Nonlinear Integral and Integrodifferential Equations** Donal O'Regan, Maria Meehan, 2012-12-06 The theory of integral and integrodifferential equations has advanced rapidly over the last twenty years Of course the question of existence is an age old problem of major importance This monograph is a collection of some of the most advanced results to date in this field The book is organized as follows It is divided into twelve chapters Each chapter surveys a major area of research Specifically some of the areas considered are Fredholm and Volterra integral and

integro-differential equations resonant and nonresonant problems in integral inclusions stochastic equations and periodic problems We note that the selected topics reflect the particular interests of the authors Donal O Regan Maria Meehan

CHAPTER 1 INTRODUCTION AND PRELIMINARIES 1 1 Introduction The aim of this book is firstly to provide a comprehensive existence theory for integral and integro-differential equations and secondly to present some specialised topics in integral equations which we hope will inspire further research in the area To this end the first part of the book deals with existence principles and results for nonlinear Fredholm and Volterra integral and integro-differential equations on compact and half open intervals while selected topics which reflect the particular interests of the authors such as nonresonance and resonance problems equations in Banach spaces inclusions and stochastic equations are presented in the latter part

Integral Equations and Their Applications Matiur Rahman, 2007 The book deals with linear integral equations that is equations involving an unknown function which appears under the integral sign and contains topics such as Abel's integral equation Volterra integral equations Fredholm integral equations singular and nonlinear integral equations orthogonal systems of functions Green's function as a symmetric kernel of the integral equations

**On a Nonlinear Integral Equation** Komorath Padmavally, 1958

**Nonlinear Integral Operators and Applications** Carlo Bardaro, Julian Musielak, Gianluca Vinti, 2008-08-22 In 1903 Fredholm published his famous paper on integral equations Since then linear integral operators have become an important tool in many areas including the theory of Fourier series and Fourier integrals approximation theory and summability theory and the theory of integral and differential equations As regards the latter applications were soon extended beyond linear operators In approximation theory however applications were limited to linear operators mainly by the fact that the notion of singularity of an integral operator was closely connected with its linearity This book represents the first attempt at a comprehensive treatment of approximation theory by means of nonlinear integral operators in function spaces In particular the fundamental notions of approximate identity for kernels of nonlinear operators and a general concept of modulus of continuity are developed in order to obtain consistent approximation results Applications to nonlinear summability nonlinear integral equations and nonlinear sampling theory are given In particular the study of nonlinear sampling operators is important since the results permit the reconstruction of several classes of signals In a wider context the material of this book represents a starting point for new areas of research in nonlinear analysis For this reason the text is written in a style accessible not only to researchers but to advanced students as well

A First Course in Integral Equations Abdul-Majid Wazwaz, 1997 This book presents the subject of integral equations in an accessible manner for a variety of applications Emphasis is placed on understanding the subject while avoiding the abstract and compact theorems A distinctive feature of the book is that it introduces the recent powerful and reliable developments in this field which are not covered in traditional texts The newly developed decomposition method the series solution method and the direct computation method are thoroughly implemented which allows the topic to be far more accessible The book also

includes some of the traditional techniques for comparison Using the newly developed methods the author successfully handles Fredholm and Volterra integral equations singular integral equations integro differential equations and nonlinear integral equations with promising results for linear and nonlinear models Many examples are given to introduce the material in a clear and thorough fashion In addition many exercises are provided to build confidence ease and skill in using the new methods This book may be used as a text for advanced undergraduates and graduate students in mathematics and scientific areas and as a work of reference for research study of differential equations and numerical analysis

*Singular Integral Equations* E.G. Ladopoulos, 2013-03-09 The present book deals with the finite part singular integral equations the multidimensional singular integral equations and the non linear singular integral equations which are currently used in many fields of engineering mechanics with applied character like elasticity plasticity thermoelastoplasticity viscoelasticity viscoplasticity fracture mechanics structural analysis fluid mechanics aerodynamics and elastodynamics These types of singular integral equations form the latest high technology on the solution of very important problems of solid and fluid mechanics and therefore special attention should be given by the reader of the present book who is interested for the new technology of the twentieth one century Chapter 1 is devoted with a historical report and an extended outline of References for the finite part singular integral equations the multidimensional singular integral equations and the non linear singular integral equations Chapter 2 provides a finite part singular integral representation analysis in  $L_p$  spaces and in general Hilbert spaces In the same Chapter are investigated all possible approximation methods for the numerical evaluation of the finite part singular integral equations as closed form solutions for the above type of integral equations are available only in simple cases Also Chapter 2 provides further a generalization of the well known Sokhotski Plemelj formulae and the Nother theorems for the case of a finite part singular integral equation

**First Course In Integral Equations, A (Second Edition)** Abdul-majid Wazwaz, 2015-05-04 This second edition integrates the newly developed methods with classical techniques to give both modern and powerful approaches for solving integral equations It provides a comprehensive treatment of linear and nonlinear Fredholm and Volterra integral equations of the first and second kinds The materials are presented in an accessible and straightforward manner to readers particularly those from non mathematics backgrounds Numerous well explained applications and examples as well as practical exercises are presented to guide readers through the text Selected applications from mathematics science and engineering are investigated by using the newly developed methods This volume consists of nine chapters pedagogically organized with six chapters devoted to linear integral equations two chapters on nonlinear integral equations and the last chapter on applications It is intended for scholars and researchers and can be used for advanced undergraduate and graduate students in applied mathematics science and engineering Click here for solutions manual

[Iterative Solution of Nonlinear Integral Equations](#) James Edward McFarland, 1960

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