Preface

This is the abstract sequel booklet monograph to the recently published monographs, by the same authors, titled: "Intelligent Numerical Methods: Applications to Fractional Calculus," Studies in Computational Intelligence 624, and "Intelligent Numerical Methods II: Applications to Multivariate Fractional Calculus," Studies in Computational Intelligence 649, both in Springer Heidelberg New York, 2016. It is regarding applications of Newton-like and other similar methods for solving abstract functional equations, which involve abstract Caputo and Canavati type fractional derivatives. The functions we are dealing with are Banach space valued of a real domain. These are studied for the first time in the literature, and chapters are self-contained and can be read independently. In each chapter, the first sections are prerequisites for the final section of abstract fractional calculus applications. This short monograph is suitable to be used in related graduate classes and research projects. We exhibit the maximum of these numerical methods at the abstract fractional level.

The motivation to write this monograph came by the following: Various issues related to the modeling and analysis of fractional order systems have gained an increased popularity, as witnessed by many books and volumes in Springer's program:

http://www.springer.com/gp/search?query=fractional&submit=Prze%C5%9Blij

and the purpose of our book is to provide a deeper formal analysis on some issues that are relevant to many areas for instance: decision making, complex processes, systems modeling and control, and related areas. The above are deeply embedded in the fields of engineering, computer science, physics, economics, social and life sciences.

The list of covered topics here follows:

explicit–implicit methods with applications to Banach space valued functions in abstract fractional calculus,
convergence of iterative methods in abstract fractional calculus,
equations for Banach space valued functions in fractional vector calculi,

iterative methods in abstract fractional calculus,
semi-local convergence in right abstract fractional calculus,
algorithmic convergence in abstract g-fractional calculus,
iterative procedures for solving equations in abstract fractional calculus,
approximate solutions of equations in abstract g-fractional calculus,
generating sequences for solving equations in abstract g-fractional calculus,
and numerical optimization with fractional invexity.

An extensive list of references is given per chapter.

This book's results are expected to find applications in many areas of applied mathematics, stochastics, computer science, and engineering. As such, this short monograph is suitable for researchers, graduate students, and seminars of the above subjects, also to be in all science and engineering libraries.

The preparation of this book took place during the academic year 2016–2017 in Memphis, Tennessee, and Lawton, Oklahoma, USA.

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Lawton, USA
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George A. Anastassiou
Ioannis K. Argyros

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Anastassiou, G.A.; Argyros, I.K.

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