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George A. Anastassiou

Inequalities Based on Sobolev Representations

Springer

George A. Anastassiou
Department of Mathematical Sciences
University of Memphis
Memphis, TN 38152
USA
ganastss@memphis.edu

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To the memory of my friend Khalid Khouri who left this world too young

The measure of success for a person is the magnitude of his/her ability to convert negative conditions to positive ones and achieve goals

—The author

Preface

This brief monograph is the first one to deal exclusively with very general tight integral inequalities of Chebyshev–Grüss, Ostrowski types, and of the comparison of integral means. These rely on the well-known Sobolev integral representations of functions. The inequalities engage ordinary and weak partial derivatives of the involved functions. Applications of these developments are illustrated. On the way to prove the main results we derive important estimates for the averaged Taylor polynomials and remainders of Sobolev integral representations. The exposed results expand to all possible directions. We examine both the univariate and multivariate cases.

For the convenience of the reader, each chapter of this book is written in a self-contained style.

This treatise relies on the author's last year of related research work.

Advanced courses and seminars can be taught out of this brief book. All necessary background and motivations are given in each chapter. A related list of references is also given at the end of each chapter. These results first appeared in my articles that are mentioned in the references. The results are expected to find applications in many subareas of mathematical analysis, inequalities, partial differential equations, information theory, etc. As such this monograph is suitable for researchers, graduate students, seminars of the above subjects, and also for all science libraries.

The preparation of this booklet took place during 2010–2011 in Memphis, TN, USA.

I thank my family for their dedication and love to me, which was the strongest support during the writing of this book.

Department of Mathematical Sciences
The University of Memphis, TN, USA
March 5, 2011

George A. Anastassiou

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