NEW DOCTORAL DEGREES

IN THE DEPARTMENT OF MATHEMATICS
UNIVERSITY OF OSIJEK

Dr. Mihaela Ribičić Penava received her PhD in Mathematics from the Department of Mathematics of the University of Zagreb on 21 April 2009 with the dissertation entitled "Montgomery identity, quadrature formulae and derived inequalities " (Mentors: Dr. M. Klaričić Bakula and Dr. A. Čižmešija).

Abstract

The aim of this PhD dissertation is to give generalizations of classical quadrature formulae with two, three and four nodes using some generalizations of the weighted Montgomery identity. Thereby families of weighted and non-weighted quadrature formulae are considered, some error estimates are derived, and sharp and the best possible inequalities as well as Ostrowski type inequalities are proved.

Classes of weighted and non-weighted two-point quadrature formulae are studied and corresponding error estimates are calculated. Two-point Gauss-Chebyshev formulae of the first and of the second kind as well as generalizations of the trapezoidal formula, Newton-Cotes two-point formula, Maclaurin two-point formula and midpoint formula are obtained as special cases of these formulae.

The dissertation deals with three-point quadrature formulae, generalizations of Simpson's, dual Simpson's and Maclaurin's formula, three-point Gauss-Chebyshev formulae of the first kind and of the second kind that follow from a general formula, as well as corresponding error estimates.

It is also dedicated to closed four-point quadrature formulae from which a weighted and non-weighted generalization of Bullen type inequalities for $(2n)-$ convex functions is obtained. As a special case, Simpson's 3/8 formula and Lobatto four-point formula with related inequalities are considered.

Weighted Euler type identities, which represent weighted integral one-point formulae, are worked out in the dissertation as well. By means of these identities, generalized weighted quadrature formulae are derived in which the integral is estimated by function values in n nodes and generalizations of Gauss-Chebyshev formulae of the first and of the second kind are given. Error estimates are derived and some sharp and best possible inequalities are proved for all given formulae.

Published papers

[1] M. Klaričić Bakula, **M. Ribičić Penava**, *General four-point quadrature formulae with applications for* α-*L*-Hölder *type functions*, Journal of Mathematical Inequalities, 2009, accepted for publication.

[2] A. Aglić Aljinović, J. Pečarić, **M. Ribičić Penava**, *Sharp integral inequalities based on general two-point formula via an extension of Montgomery identity*, ANZIAM journal, 2008, accepted for publication.

[3] M. Klaričić Bakula, J. Pečarić, **M. Ribičić Penava**, *General three-point quadrature formulae with applications for α-L-*Hölder *type functions*, Journal of Mathematical Inequalities **2**(2008), 343–361.

[4] J. Pečarić, **M. Ribičić Penava**, A. Vukelić, *Euler's method for weighted integral formulae*, Applied Mathematics and Computation **206**(2008), 445–456.

[5] M. Klaričić Bakula, J. Pečarić, **M. Ribičić**, *Companion inequalities to Jensen's inequality for m-convex and (α,m)-convex functions*, Journal of Inequalities in Pure and Applied Mathematics **7**(2007), 1–32.

[6] D. Jukić, D. Marković, **M. Ribičić**, A. Krajina , *On the choice of initial approximation of the least squares estimate in some growth models of exponential type*, Proceedings of the 9th International Conference on Operational Research, Trogir, October 2–4, 2002 pp. 47-55.