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Optimal Approximations for Linearization of Sensor Transfer Curves

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ABSTRACT: Some common issues associated with sensors are the nonlinearities and cross-dependencies of the transducers. These can be solved by devising the appropriate algorithms for linearization and correction of cross-dependencies. A common approach relies on digitizing the analog sensor output and then processing on an embedded processor a series of digitized samples. This implies many times the computation of a nonlinear function of one or multiple real arguments. The problem of implementing the computation of the nonlinear functions on low cost microcontrollers with reduced RAM spaces and in contexts where power saving is essential is addressed by introducing some optimal approximations for such nonlinear functions. Three approaches were considered: optimal piecewise linear approximants, Padé approximants, and other rational approximants. Several algorithms for finding optimal approximations were implemented, and their results are exemplified for the case of real sensor transfer curves.

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Approximation by a Positive Linear Operator in Polynomial Weighted Spaces

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ABSTRACT: We consider a positive linear operator in the polynomial weighted space of functions of one variable. We give a theorem on the convergence of this sequence of operators to the approximated function and we study the order of approximation.

KEY WORDS: positive linear operator, weighted space

MSC 2000: 41A36

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Closed Form Evaluation of a Multiple Harmonic Series

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ABSTRACT: The paper is about the calculation of the multiple alternating harmonic series

$$A_k = \sum_{n_1=1}^{\infty} \sum_{n_2=1}^{\infty} \cdots \sum_{n_k=1}^{\infty} (-1)^{n_1+n_2+\cdots+n_k} \frac{H_{n_1+n_2+\cdots+n_k}}{n_1+n_2+\cdots+n_k},$$

where $k \geq 1$ is a nonnegative integer and $H_n = \sum_{j=1}^n 1/j$, denotes the n th harmonic number. We show that A_k can be written as a rational linear combination of 1, $\ln 2$, $\ln^2 2$ and $\zeta(2)$.

KEY WORDS: Multiple harmonic series, dilogarithm function, the n th harmonic number.

MSC 2000: Primary 40B05, Secondary 26A42

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On some $f(3, \varepsilon)$ -structures of complex Finsler spaces

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ABSTRACT: It is shown that some natural framed $f(3, \varepsilon)$ -structures of corank 2 exist on the total space of holomorphic tangent bundle of a complex Finsler space.

KEY WORDS: complex Finsler spaces, framed f -structures.

MSC 2000: 53B40, 53C60.

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h-Semi Strongly E-Convex Functions

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ABSTRACT: Starting from semi strongly E-convex functions introduced by E. A. Youness and T. Emam, from h-convex functions introduced by S. Varošanec and from the more general concept of h-convex functions introduced by A. Hány we define and study h-semi strongly E-convex functions. We study some properties of them.

KEY WORDS: strongly E-convex sets, strongly E-convex functions, semi strongly E-convex functions, h-convex functions, h-strongly E-convex functions

MSC 2000: 26B25

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Approximation Linear Operators Generated by Cross Polynomials

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ABSTRACT: In this paper we construct a new positive linear operator using the generating functions of some cross polynomials. Quantitative estimates are given using the first and the second moduly of continuity.

KEY WORDS: cross sequences, generating functions, positive linear operators, moduly of continuity

MSC 2000: 41A36

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Strong-stability-preserving, k -step, 4- to 10-stage, Hermite–Birkhoff Time-discretizations of Order 11

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ABSTRACT: Optimal k -step, 4- to 10-stage, explicit, strong-stability-preserving Hermite–Birkhoff (SSP HB) methods of order 11 with nonnegative coefficients which satisfy a monotonicity property are constructed by combining linear k -step methods of order 8 with 4- to 10-stage Runge–Kutta (RK) methods of order 4. It is seen that the 8-step, 6- and 7-stage SSP HB methods have largest effective SSP coefficient among the 11th-order HB methods on hand. Some of the new HB methods have larger effective SSP coefficients and larger maximum effective CFL numbers than Huang’s 7-step hybrid method of order 7 on Burgers’ equations.

KEY WORDS: Strong stability preserving; Hermite–Birkhoff method; SSP coefficient; time discretization; method of lines; comparison with other SSP methods

MSC 2000: 65L06;65M20

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Some New Classes of Sequences that Converge to a Generalization of Ioachimescu's Constant

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ABSTRACT: The purpose of the paper is to give some sequences that converge quickly to a generalization of Ioachimescu's constant, i.e. the limit of the sequence

$$\left(\frac{1}{\sqrt{a}} + \frac{1}{\sqrt{a+1}} + \cdots + \frac{1}{\sqrt{a+n-1}} - 2(\sqrt{a+n-1} - \sqrt{a}) \right)_{n \in \mathbb{N}},$$

where $a \in (0, +\infty)$.

KEY WORDS: sequence, convergence, approximation, Ioachimescu's constant, Bernoulli number.

MSC 2000: 11Y60, 11B68, 40A05.

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