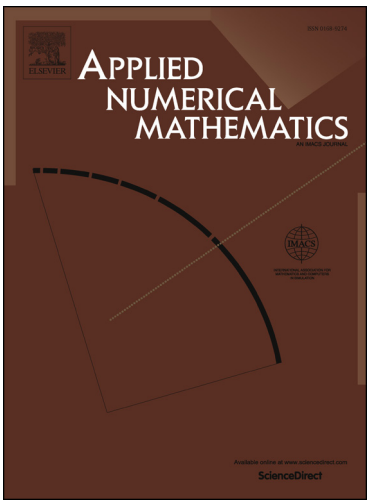
Accepted Manuscript



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PII: S0168-9274(16)30223-9
DOI: http://dx.doi.org/10.1016/j.apnum.2016.11.004
Reference: APNUM 3128

To appear in: *Applied Numerical Mathematics*

Received date: 26 October 2015
Revised date: 5 November 2016
Accepted date: 9 November 2016

Please cite this article in press as: H. Majidian, On the decay rate of Chebyshev coefficients, *Appl. Numer. Math.* (2016), http://dx.doi.org/10.1016/j.apnum.2016.11.004

On the decay rate of Chebyshev coefficients

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Abstract

It is well known that the coefficients of the Chebyshev expansion of a function $f \in C[-1,1]$ decay at a rate depending on the smoothness of f. New decay rates for the Chebyshev coefficients as well as their partial sums are obtained which are sharper than those proposed so far.

Keywords: Chebyshev approximation, Chebyshev coefficients, error bound, Clenshaw-Curtis points.
2000 MSC: 42A10, 42A16

1. Introduction

It is well-known that Chebyshev points are good nodes for polynomial interpolation. They have found wide applications in numerical approximation of various problems, mainly because of the minimax property of the Chebyshev polynomials. The well-known Clenshaw-Curtis quadrature rule is an example of their applications in numerical integration.

Many error bounds have been given for such interpolation and corresponding quadrature rules (see, e.g., [1, 6, 9, 3] and references therein). These error bounds can be categorized into two main groups: Bounds obtained from the well-known error estimate

$$f(x) - p_N(x) = \frac{f^{(N+1)}(\xi_x)}{(N+1)!} \prod_{n=0}^{N} (x - x_n), \tag{1}$$

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