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THE CITY UNIVERSITY OF NEW YORK AND
THE UNIVERSITY OF QUEENSLAND, BRISBANE, AUSTRALIA

CONTINUITY OF THE VARISOLVENT CHEBYSHEV OPERATOR

BY CHARLES B. DUNHAM

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In this note we show that the Chebyshev operator T is continuous at all functions whose best approximations are of maximum degree. Let F be an approximating function unisolvent of variable degree on an interval $[\alpha, \beta]$ and let the maximum degree of F be n. Let P be the parameter space of F. All functions considered will be continuous and for such functions we define the norm

$$\|g\| = \max\{ | g(x) | : \alpha \leqq x \leqq \beta\}.$$

The Chebyshev problem is, for a given continuous function f, to find an element $T(f) = F(A^*, \cdot)$, $A^* \in P$, for which

$$\rho(f) = \inf\{\|f - F(A,\cdot)\| : A \in P\}$$

is attained. Such an element $T(f)$ is called a best Chebyshev approximation to f on $[\alpha, \beta]$. $T(f)$ can fail to exist, but is unique and characterized by alternation if it exists. Definitions and theory are given in [1].

LEMMA 1. *Let $F(A, \cdot)$ be the best approximation to f and F have degree n at A. Let $x_0, \cdots, x_n$ be an ordered set of points on which $f - F(A, \cdot)$ alternates n times. If $\|f-g\| < \delta$ and $\|g - F(B, \cdot)\| \leqq \rho(g) + \delta$ then*

$$(1) \quad (-1)^i[F(B, x_i) - F(A, x_i)] \operatorname{sgn}(f(x_0) - F(A, x_0)) \geqq -3\delta, \quad i = 0, \cdots, n.$$

The lemma can be obtained using arguments similar to those of Rice [2, p. 63].

LEMMA 2. *Let F be of degree n (maximal) at A then for given $\delta > 0$*