

İSTANBUL ANALYSIS SEMINARS

WEIGHTED APPROXIMATION BY ANALOGUES OF BERNSTEIN OPERATORS FOR RATIONAL FUNCTIONS

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Abstract: The Bernstein polynomials $B_n(f, x)$ associated with a function f defined on $[0, 1]$ have been the subject of much recent research and have been generalized in many directions. For example V.S. Videnskii introduced a generalization of Bernstein operators for approximation by rational functions with fixed poles $U_n(f, x)$.

Recently many authors pay attention to weighted approximation by classical polynomial operators and to construction of their weighted modifications. The reason is that usual operators are not always suitable for approximating functions with singularities in weighted spaces. For instance, the sequence of classical Bernstein operators $B_n(f, x)$ is not bounded in the space but its slight modification $B_n^*(f, x)$ is.

We consider modifications of the Videnskii operators $V_n^*(f, x)$ and pay attention to weighted boundedness and weighted approximation by classical polynomial operators and to construction of their weighted modifications. We investigate approximation properties of Videnskii operators in the weighted norm under some restrictions. The main theorem of the research is the following:

Theorem. Suppose that ρ_{ni} satisfy $\rho_{ni} > C > 0$ and $\sum_{i=1}^n \frac{1}{\rho_{ni}} \leq C$, then:

(a)

$$\|V_n^*(f)\|_{C_w} \leq C \|f\|_{C_w};$$

(b)

$$\|f - V_n^*(f)\|_{C_w} \leq \frac{C}{n} \|\varphi^2 f''\|_{C_w}, \quad \text{if } f \in W_\omega^2.$$

This is joint work with Prof. Alexey Lukashov of Fatih University.

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