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On Yu. N. Subbotin's Circle of Ideas in the Problem of Local Extremal Interpolation on the Semiaxis

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Abstract—Subbotin's problem of extremal functional interpolation of numerical sequences $\{y_k\}_{k=0}^{\infty}$ such that their first terms $y_0, y_1, \ldots, y_{s-1}$ are given and the nth-order divided differences are bounded is considered on an arbitrary grid $\Delta = \{x_k\}_{k=0}^{\infty}$ of the semiaxis $[x_0; +\infty)$. It is required to find an n-times differentiable function f with the smallest norm of the nth-order derivative in the space L_∞ such that $f(x_k) = y_k$ $(k \in \mathbb{Z}_+)$. Subbotin formulated and studied this problem only for a uniform grid on the semiaxis $[0; +\infty)$. We prove the finiteness of the smallest norm for $s \geq n$ if the smallest step of the interpolation grid $\underline{h} = \inf\limits_k (x_{k+1} - x_k)$ is bounded away from zero and the largest step $\overline{h} = \sup\limits_k (h_{k+1} - h_k)$ is bounded away from infinity. In the case of the second derivative (i.e., for $n = 2$), the required value is calculated exactly for $s = 2$ and is estimated from above for $s \geq 3$ in terms of the grid steps.

Keywords: local interpolation, semiaxis, arbitrary grid, divided differences.

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