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8. Analysis

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Nasyrov, Samyon, Kazan State University, Russia

Robin capacity and lift of infinitely thin airfoils

In 1934 M. A. Lavrent'ev proved the following result. Let l and K_0 be positive constants, $K_0 l < 1/21$ $(*)$. Denote Γ the class of all plane arcs γ of length l with the curvature $K(s) \leq K_0$, $s \in [0, l]$ where s is the arc length of γ. Then an arc of a circle of radius K_0^{-1} and length l has maximal aerodynamic lift amongst all arcs $\gamma \in \Gamma$. Using the notions of Robin capacity and extremal length family of curves we increase more than twice the constant $1/21$ in $(*)$. We also show that the lift of an airfoil is the difference between Robin capacities of the upper and the lower parts of its boundary. Nonconstant majorants for $K(s)$ are considered, too.