749.30004

Koepf, Wolfram

On the interplay between geometrical and analytical properties of functions of bounded boundary rotation. (English)

Complex Variables, Theory Appl. 16, No.2/3, 177-207 (1991). [ISSN 0278-1077]

Let f be analytic and locally univalent in the unit disk D, $f(0) = f'(0) - 1 = 0$. The author considers the expressions

$$\left|-\overline{z} + \frac{1}{2}(1-|z|^2)\frac{f''(z)}{f'(z)}\right|,\ (1-|z|^2)\left|\frac{f''(z)}{f'(z)}\right| \text{ and } (1-|z|^2)^2\left|\left(\frac{f''(z)}{f'(z)}\right)' - \frac{1}{2}\left(\frac{f''(z)}{f'(z)}\right)^2\right|,\ z \in D.$$

First he derives properties of the behaviour of these expressions if $x \to \partial D$ and $f(\partial D)$ is a polygon in terms of the angles of these polygons. Then he succeeds in generalizing these properties to functions of bounded boundary rotation. This means a geometric interpretation of the above expressions in this case. The knowledge of these relations enables him to give a multitude of new interesting theorems about them resp. their geometric counterparts especially for convex and close-to-convex functions.

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Keywords : convex functions; locally univalent; bounded boundary rotation; close-to-convex functions

Classification:

- 30C45 Special classes of univalent and multivalent functions
- 30C50 Coefficient problems for univalent and multivalent functions
- 30C75 Extremal problems for (quasi-)conformal mappings, other methods
- 30C80 Maximum principle, etc. (one complex variable)