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8. Analysis

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On the domain of normality in iteration theory

Let f be a function of the complex variable z. The natural iterates f_n of f are defined inductively by

$$f_0(z) = z, f_1(z) = f(z), f_{n+1}(z) = f(f_n(z)), n = 0, 1, 2, \cdots$$

The Fatou set $\mathcal{F}$ is defined as $\mathcal{F}(f) = \{f_n(z)$ is normal (in the sense of Montel) in some neighbourhood of $z\}$. Its complement is the Julia set $\mathcal{J}(f)$. Both $\mathcal{F}(f)$ and $\mathcal{J}(f)$ have been intensively studied in the recent years. If f is a nonlinear analytic function, then $\mathcal{J}(f)$ is closed, nonempty perfect and has no interior points unless it is the whole plane. $\mathcal{J}(f)$ divides the plane into various components of $\mathcal{F}(f)$. In this paper we consider some results on the components of $\mathcal{F}(f)$. For example we prove some sufficient conditions under which $\mathcal{F}(f)$ is empty for entire and meromorphic f. We also prove some theorems on the existence of fixed points on the boundary of some components of $\mathcal{F}(f)$.