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Well-Approximable Points for Julia Sets with Parabolic and Critical Points

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Abstract. In this paper we consider rational functions $f: \overline{\mathbb{C}} \rightarrow \overline{\mathbb{C}}$ with parabolic and critical points contained in their Julia sets $J(f)$ such that

$$\sum_{n=1}^{\infty} |(f^n)'(f(c))|^{-1} < \infty$$

for each critical point $c \in J(f)$. We calculate the Hausdorff dimensions of subsets of $J(f)$ consisting of elements z for which

$$\inf\{\text{dist}(f^n(z), \text{Crit}(f)) : n \geq 0\} > 0$$

and which are well-approximable by backward iterates of the parabolic periodic points of f .

Keywords. Rational functions, critical phenomena, ergodic theory, fractal geometry, Diophantine analysis.

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