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ITERATES FOR A RESIDUAL CLASS OF FUNCTIONS

The talk was a report of joint work with A. M. Bruckner.

A considerable amount of recent research has been devoted to studying the iterative behavior of continuous functions mapping an interval into itself. Much of this work focuses on well-behaved functions; that is functions that satisfy certain differentiability conditions, are piecewise monotonic, and possess other properties that help in classifying iterative behavior.

These well-behaved functions have commonly been used as models for various physical, social and biological phenomena. In [P] (pg. 100, Theorem 5.2) one finds that all functions in a certain class that is sufficiently large to contain many of the functions that appear in practice, are of one of three types: i) a single periodic orbit attracts the orbits of most points; ii) a Cantor set attracts the orbits of most points; iii) there is sensitive dependence on initial conditions, i.e. for each x in the interval there exists $\varepsilon > 0$ such that for each $\delta > 0$, there exists a natural number n such that $|f^k(x-\delta,x+\delta)| > \varepsilon$ for all $k \geq n$. ($|J|$ denotes the length of the interval J.) Possibility (iii) implies very little attraction of orbits, but does allow certain chaotic behavior such as the existence of points whose orbits are dense. One also finds in the recent literature constructions of continuous functions that exhibit various sorts of chaotic behavior. See, for example, [BH], [K], [S].