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THEORY OF ITERATIONS OF POLYNOMIAL FAMILIES IN THE COMPLEX PLANE

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1. Introduction. 1.1. The significant advances, achieved recently in the theory of one-dimensional dynamical systems, are connected to a great extent with the investigation of concrete families of mappings. In the first place, this refers to the quadratic family:

$$f_c : z \to z^2 - c. \tag{1.1}$$

For complex values of the parameter c one has observed a continual variety in the behavior of the iterations of the mappings $f_c\colon \mathbf{C} \to \mathbf{C}$. The boundary separating the stable mappings from each other is the boundary of the so-called Mandelbrot set M [1]. It consists of those $c \in \mathbf{C}$, for which the iterations $f_c^n(0) = O(1)$ when $n \to \infty$. A special role is played by the iterations of the point $z = 0$, since this is the unique critical point of the function f_c. One of the properties of M consists in the fact that each point of the boundary of M is a limit point for the superstable values of c (a value of the parameter c is said to be superstable if f_c has a superstable cycle, i.e., a cycle which contains the critical point). It is proved in [2] that the superstable values of c are asymptotically distributed with respect to some measure with support on ∂M. In this paper we give a generalization of this statement to the family

$$z \to z^p - c\,(p \in \mathbf{N},\ p \geq 2). \tag{1.2}$$

We give the properties of this measure and we also consider some series connected with the set M and with its generalization to the family (1.2). Finally, we describe a linear algorithm for the computation of the moments of the measure (for p = 2).

1.2. We recall the basic definitions. The successive application of the mapping $f\colon U \to U$ generates the iterates $f^n : U \to U$; $f^1 \equiv f$, $f^{n+1} = f(f^n)$, $(x_n)_{n\geq 0}$, $x_n = f^n(x_0)$ is the orbit of the point x_0; if $x_n = x_0$, then x_0 is a periodic point of period n; the smallest of the periods of x_0 is some $m \geq 1$ and $m|n$; the points $\{x_0, x_1, \ldots, x_{m-1}\}$ form a cycle; if f is differentiable, then

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