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General Relationship between the Total Number of Deficient Values of Meromorphic Functions and the Total Number of Borel Directions Guides Evolutionary Calculation Research

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Abstract:This paper studies the general relationship between the total deficient value of the meromorphic function and the total number of Borel directions to guide evolutionary calculations. The total deficient value of the meromorphic function is one of the main contents of the argument distribution theory, and the total number of Borel directions is the first in the complex analysis. The basic evaluation theorem of the class, the complex value in its definition is extended to the case of small functions, and the definition of the deficient function is obtained. At the same time, the definition of the Borel direction under the deficient function as a rational function is obtained. From these new definitions, we prove For the meromorphic function $w(z)$ that satisfies the growth condition lim$r$→∞ $T(r,w)$ ln2 r = ∞ in the entire complex plane, there is at least one Nevanlinna direction whose loss function is a rational function.

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Keywords: General Relationship, Deficient Values, Meromorphic Functions, Borel Direction

INTRODUCTION

The research problem of this dissertation is raised with the development of the theory of meromorphic function value distribution and the theory of uniqueness of meromorphic function [1]. In recent years, many important advances have been made in the theory of value distribution of meromorphic functions, and the theory of Nevanlinna value distribution of translation [2] operators and difference operators has emerged. Therefore, how to combine these emerging Nevanlinna value distribution theories with shared values and generate new applications [3] is a frontier issue worthy of in-depth study. The value distribution theory of meromorphic functions was developed [4] by the Finnish mathematician R. Created by Nevanlinna. R. Starting from the Poisson-Jensen formula, Nevanlinna [5] introduced the characteristic function of meromorphic functions, established the first and second basic theorems of Nevanlinna, and then proved the Picard theorem in another way [6], demonstrating the theoretical value of the meromorphic function value distribution theory for the first time [7].

For nearly half a century, the value distribution theory of meromorphic functions has been continuously developed and improved [8], and has been widely used in the uniqueness theory of meromorphic functions, the normal family theory of meromorphic functions [9], the study of meromorphic solutions of complex differential equations, and the Julia set of complex dynamical systems [10]. The research with Fatou set and the hotspot complex difference equations in recent years. So far, the theory of meromorphic [11] function value distribution and its application is still the direction of international [12] frontier research. The distribution of meromorphic function values includes two major contents: growth and argument [13] distribution. In 1919, G. Julia first applied the normal family theory to prove the existence of the Julia direction beyond [14] the entire function, thus pioneering the study of the argument distribution theory of meromorphic functions. In 1928, G. Valiron [15] further proved the existence of the Borel direction, which greatly promoted the development of the angular distribution [16]. There are also many famous mathematicians in my country who have worked in this field and achieved outstanding results [17], such as Li Guoping, Yang Le, Zhang Guanghou, Zhuang Qitai and other famous professors. However, regarding the [18] argument distribution in complex oscillations, it was not until 2004 that Wu Shengjian first studied the argument distribution [19] of the zero points of the second-order differential equations [20] and obtained some important results. This created a new [21] field of research. In recent years, many scholars have done further research on the argument distribution in complex oscillations, and have obtained some meaningful results [22].

Classical meromorphic function uniqueness theory has produced fruitful results, and the research topics involved in these results are roughly concentrated in the following [23] aspects: one is to study the uniqueness when two general meromorphic functions have certain shared values [24] (sets); the other is Study the uniqueness when the meromorphic function and its derivative have certain sharing values (sets); the third is to study the uniqueness when the derivatives of two meromorphic functions have some sharing values (sets); the fourth is to study the uniqueness when the derivatives of two meromorphic functions have certain sharing values (sets); Differential polynomials of pure functions are unique when they share certain values (sets); the fifth is to study the uniqueness of algebraic functions. For the introduction of the results, please refer to the monograph "The Uniqueness Theory of Meromorphic Functions" by Yi Hongxun and Yang Chongjun. The research techniques of the classic uniqueness theory of meromorphic functions mainly rely on the first fundamental theorem, the second fundamental theorem, the logarithmic derivative lemma and the construction of small functions. The most profound tool is the logarithmic derivative lemma, which can best reflect it. The key technology of innovation is the construction of small functions. However, both the logarithmic derivative lemma and the auxiliary small function are related to the derivative function of the meromorphic function, which makes the research on the uniqueness of the meromorphic function and its translation operator or difference operator lack the necessary key technology. In the research of complex analysis theory, the value distribution of meromorphic functions has always been a classic and active hot topic.

THE PROPOSED METHODOLOGY

The Total Number of Deficient Values of the Meromorphic Function

Meromorphic function value distribution theory is also called Nevanlinna value distribution theory. In 1925, the Finnish mathematician R. Nevanlinna From? Starting from the formula of O11-七11 si 11, several real functions describing the characteristics of meromorphic functions are introduced, namely approximation function (Proximity Function), counting function (Conting function) and characteristic function (Chaaracteris) to establish meromorphic function. Value distribution theory. For a detailed introduction to this theory, please refer to the monograph on the counting function iV(r,/), which describes the characteristics of the number of poles (with weights) of the meromorphic function in the disc.

If the finite complex number a is taken, it describes the characteristic that the meromorphic function/Sr is the number of a-value points (with weights) between the discs. It is also pointed out here that iV(r,/) is non-decreasing and continuous with respect to r at (0, OO), and is convex with respect to lnr. The research on the uniqueness of meromorphic functions and their translation operators is a hot spot in the international frontier research that has emerged in the past decade. It began to develop after the emergence of the complex-domain difference simulation theory of the meromorphic function value distribution theory. Through the study of the uniqueness of the meromorphic function and its translation operator, a sufficient condition for judging the periodicity of the meromorphic function can be given, and it can also promote the correlation when the general meromorphic function and the periodic meromorphic function have some sharing values. Research on the nature. Investigate the problem of uniqueness when the meromorphic function /(4 and its derivative /(fc)(z) share the value.

Famous results include L. A. Rubel and C. C. The result of Yang's proof: the non-constant integer function /(2) and /'(2) must be identical when sharing two finite complex CMs. After the result, E. Muse and N. Steinmetz Bu Yang Lianzhong, Li Ping and C. C. Yang et al. generalized it as: a non-constant integer function /(4) and /(fc) (2) must be identical when sharing two finite complex IMs. The result was again by G. G. Gundersen, G. Prank and W. Ohlenroth, G. Frank and G. Weissenborn et al.

Total number of Borel directions

This chapter also studies the uniqueness of the three finite values shared by the meromorphic function and the periodic meromorphic function for the class of meromorphic functions with at most a finite number of poles. According to the example 3.5 in the first section above, it can be seen that if the "at most finite number of poles" is removed, then when the meromorphic function g and the periodic meromorphic function/share "1CM+2IM", the identity relationship or the functional relationship cannot be obtained (2). Furthermore, the following example shows that if only the meromorphic function g or “has a finite number of poles at most” is required, then the identity relationship or functional relationship cannot be obtained under the “1CM+MM” sharing condition (2). If there is zO such that corpse (z0) = 0, then from equations (4_2.1) and (4.2.3) know that POz0 + c) =1 , And then zO+nc = 0 holds for all positive integers n, but this is contradictory with zO+nc;) is a non-zero polynomial.

hen Pb is a non-zero constant polynomial. On the other hand, if there is q such that Q(sentence + c) = 0, then again according to equations (4.2.1) and (4.2.3), (5(2i) = 0, and then <3(The O-nc) = 0 holds for all positive integers n, but this contradicts (5(2) is a non-zero polynomial. So <5 (4 is also a non-zero constant polynomial. The theory of uniqueness of meromorphic functions is to study two Non-constant meromorphic functions have some functional relationships when the value is the same. This functional relationship may be an identity, may be a difference of a non-zero constant, or may be a difference of a Mobius transformation. Proportion, if a non-constant polynomial P(4) It has the same zero point as Q(2;) and the same multiplicity at each zero point, then z = 夊<300, where K is a non-zero finite constant. It should be pointed out here that 1.2 will be defined After the constant a in 1 is easily a small function of /, if 0CM (IM) is shared, then / and g are called a small function aCM (IM).

Secondly, it needs to be pointed out that the concept of sharing value has been extended to more general concepts such as "weak sharing", "truncated sharing", "sharing with power", "sharing with weak power", and "unilateral sharing". If these concepts are encountered in later chapters of this article, they will be introduced again. Corresponding to the famous Picard theorem and Borel theorem of opening a plane, there are two important concepts: Julia direction and Borel direction. Corresponding to the famous Nevanlinna deficit relation, Lu Yiyan and Zhang Guanghou () introduced the Nevanlinna direction, and in certain Prove the existence of this singular direction under the conditions of. Sun Daochun revised the definition of deficient value and redefined the Nevanlinna direction. He proved the existence of this Nevanlinna direction.

The General Relationship Between Meromorphic Functions and the Total Number of Borel Directions Guides Evolutionary Calculations

The purpose of this chapter is to use the relevant properties of Poincaré metric and conformal mapping to obtain the deviation theorems in several special regions, making the application of the deviation theorems more detailed and simpler, and to show that the deviation theorems in different regions are not unique of. The source of the deviation theorem is the S family: the function $f(z) = z + a2z\ 2 + a3z\ 3 + \cdot\cdot\cdot$ ($|z|$ <1) in the unit disc. It is easy to know that the S function class has been standardized, that is, $f(0) = 1$, $f'\ (0) = 1$.

Its application is very wide. In order to obtain similar results, this chapter will first study the corresponding deviation properties from the perspective of special regions, and use the commonly used conformal mapping theorem and Poincaré metric to obtain the results of this chapter: in the use of Nevanlinna value distribution theory and In the related theory of the singular direction, only the case where the deficit of the Nevanlinna direction is extended to the case where the deficit function is a rational function is only studied, and the case where the deficit is a deficit function is not completely solved, and the relationship between the generalized Nevanlinna direction and other singular directions This article has not yet been resolved. This paper adopts the symbol of Nevanlinna theory of meromorphic functions on the ring. Let f(z) and g(z) be two non-constant meromorphic functions, k is a positive integer, and a is any complex number. If f(z)−a and g(z)−a has the same zero point under the weight number (not weight number), then a is called the CM(IM) common value of f(z) and g(z). Ek(a,f) Represents the set of all k multiple zeros of f(z)−a (calculation multiplicity). Ek)(a,f) represents the set of f(z)−a ⩽ k multiple zeros (calculation multiplicity); E(k (a,f) represents the set of >k multiple zeros of f(z)−a.

Ek(a,f)=Ek(a,g) represents the k-weight zero point of f(z)−a if and only if it is the k-weight zero point of g(z)−a. It is proved that all the meromorphic points of the equation (KSE) The solutions all belong to the class called meromorphic function/belonging to class W refers to/or elliptic function, or rational function of ec), or rational function of.

CONCLUSIONS

In terms of the uniqueness of the meromorphic function and the periodic meromorphic function, the value distribution characteristics of the periodic meromorphic function are used to prove the uniqueness of the meromorphic function with super less than 1 and the periodic meromorphic function sharing 2 CM values and 1 IM value. The theorem has completely improved Brosch and Zheng Jianhua's results involving the "3CM" sharing conditions, and used a large number of examples to illustrate the accuracy of the results and the necessity of the theorem conditions, and satisfactorily answered question A1.1 in the introduction.

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