

ENTIRE SOLUTIONS FOR SEVERAL SYSTEMS OF NONLINEAR DIFFERENTIAL EQUATIONS

YU ZHANG, LIU YANG* AND LI XIONG SHI

Abstract. In this paper, by using the Nevanlinna theory and the Hadamard factorization theory of meromorphic functions, we obtain the existence and the forms of the finite order transcendental entire solutions of several systems of nonlinear differential equations.

Mathematics subject classification (2020): 35F20, 32A15, 32A22.

Keywords and phrases: Nevanlinna theory, system of functional equations, entire solution.

REFERENCES

- [1] I. N. BAKER, *On a class of meromorphic functions*, Proc. Am. Math. Soc., **17**, (1966), 819–822.
- [2] H. CARTAN, *Sur les zeros des combinaisons lineaires de p fonctions holomorphes donnees*, Matematica, **7**, (1933), 5–31.
- [3] D. C. CHANG AND B. Q. LI, *Description of entire solutions of Eiconal type equations*, Canad. Math. Bull. **55**, (2012), 249–259.
- [4] D. C. CHANG, B. Q. LI AND C. C. YANG, *On composition of meromorphic functions in several complex variables*, Forum Math., **7**, (1995), 77–94.
- [5] W. CHEN AND Q. HAN, *On entire solutions to eikonal-type equations*, J. Math. Anal. Appl., **506**, (2022), 124704.
- [6] R. COURANT AND D. HILBERT, *Methods of Mathematical Physics*, vol. II, partial differential equations, Interscience, New York, 1962.
- [7] F. GROSS, *On the equation $f^n + g^n = 1$. I*, Bull. Am. Math. Soc., **72**, (1966), 86–88.
- [8] F. GROSS, *On the equation $f^n + g^n = 1$. II*, Bull. Am. Math. Soc., **72**, (1966), 647–648.
- [9] Q. HAN AND F. LÜ, *On the functional equation $f^n(z) + g^n(z) = e^{\alpha z + \beta}$* , Journal of Contemporary Mathematical Analysis, **54**, (2019), 98–102.
- [10] P. C. HU, P. LI AND C. C. YANG, *Unicity of Meromorphic Mappings, Advances in Complex Analysis and its Applications*, vol. 1, Kluwer Academic Publishers, Dordrecht, 2003.
- [11] P. C. HU AND L. L. WU, *Topics in Fermat-type functional equations*, Journal of Shandong University (Natural Science), **56**, (2021), 23–37.
- [12] G. IYER, *On certain functional equations*, The Journal of the Indian Mathematical Society, **3**, (1939), 312–315.
- [13] B. Q. LI, *Entire solutions of eikonal type equations*, Arch. Math., **89**, (2007), 350–357.
- [14] K. LIU, I. LAINE AND L. Z. YANG, *Complex Delay-Differential Equations*, Berlin, Boston: De Gruyter, 2021.
- [15] K. LIU AND L. Z. YANG, *A note on meromorphic solutions of Fermat types equations*, An. Stiint. Univ. Al. I. Cuza Iasi Mat. (N. S.), **1**, (2016), 317–325.
- [16] J. LUO, H. Y. XU AND F. HU, *Entire solutions for several general quadratic trinomial differential difference equations*, Open Math., **19**, (2021), 1018–1028.
- [17] P. MONTEL, *Lecons sur les familles normales de fonctions analytiques et leurs applications*, Paris: Gauthier-Villars. (1927), 135–136.
- [18] G. POLYA, *On an integral function of an integral function*, J. Lond. Math. Soc., **1**, (1926), 12–15.
- [19] L. I. RONKIN, *Introduction to the Theory of Entire Functions of Several Variables*, American Mathematical Society, Providence, 1974.

- [20] M. RU, *Nevanlinna Theory and its Relation to Diophantine Approximation*, World Scientific, Singapore, 2001.
- [21] E. G. SALEEBY, *Entire and meromorphic solutions of Fermat type partial differential equations*, *Analysis*, **19**, (1999), 369–376.
- [22] W. STOLL, *Holomorphic Functions of Finite Order in Several Complex Variables*, American Mathematical Society, Providence, 1974.
- [23] R. TAYLOR AND A. WILES, *Ring-theoretic properties of certain Hecke algebras*, *Ann. Math.*, **141**, (1995), 553–572.
- [24] A. WILES, *Modular elliptic curves and Fermat's last theorem*, *Ann. Math.*, **141**, (1995), 443–551.
- [25] C. C. YANG AND P. LI, *On the transcendental solutions of a certaintype of nonlinear differential equations*, *Archiv der Mathematik*, **82**, (2004), 442–448.
- [26] L. YANG, *Value Distribution Theory*, Springer-Verlag, Berlin, 1993.