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VALUE SHARING OF CERTAIN DIFFERENTIAL POLYNOMIALS AND THE SAME OF DIFFERENCE OPERATORS OF MEROMORPHIC FUNCTIONS

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Abstract. By Zalcman's Lemma, we study a uniqueness question of meromorphic functions whose certain nonlinear differential polynomials share a nonzero value with the same of their difference operators. The results in this paper extend Theorem 1 from Yang-Hua [24] and Theorem 1 from Fang [5].

Keywords. Meromorphic functions; Shared values; Differential polynomials; Difference operators; Uniqueness theorems.

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1 Introduction

In this paper, by meromorphic functions we will always mean meromorphic functions in the complex plane. We adopt the standard notations in the Nevanlinna theory of meromorphic functions as explained in [9, 14, 25, 26]. It will be convenient to let E denote any set of positive real numbers of finite linear measure, not necessarily the same at each occurrence. For a nonconstant meromorphic function h, we denote by $T(r,h)$ the Nevanlinna characteristic of h and by $S(r,h)$ any quantity satisfying $S(r,h)=o\{T(r,h)\}$, as $r\to\infty$ and $r\notin E$.

Let f and g be two nonconstant meromorphic functions and let a be a finite complex number. We say that f and g share a CM, provided that $f-a$ and $g-a$ have the same zeros with the same multiplicities. Similarly, we say that f and g share a IM, provided that $f-a$ and $g-a$ have the same zeros ignoring multiplicities. In addition, we say that f and g share ∞ CM, if $1/f$ and $1/g$ share 0 CM, and we say that f and g share ∞ IM, if $1/f$ and $1/g$ share 0 IM (cf.[25]). We say that a is a small function of f, if a is a meromorphic function satisfying $T(r,a)=S(r,f)$ (cf.[25]). Throughout this paper, we denote by $\mu(f)$, $\rho(f)$, $\rho_2(f)$ and $\lambda(f)$ the lower order of f, the order of f, the hyper-order of f and the exponent of convergence of zeros of