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**Katsuya Ishizaki**

**A Note on the Functional Equation  $f^n + g^n + h^n = 1$  and Some Complex Differential Equations**

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**Abstract.** We consider entire and meromorphic solutions of the functional equation  $f^n + g^n + h^n = 1$ . We give new proofs for the known results about the non-existence of transcendental meromorphic solutions for  $n \geq 9$  and the non-existence of transcendental entire solutions if  $n \geq 7$ . It is shown that if there exist transcendental meromorphic functions  $f$ ,  $g$  and  $h$  satisfying the functional equation  $f^8 + g^8 + h^8 = 1$ , then  $f$ ,  $g$  and  $h$  satisfy the differential equation  $W(f^8, g^8, h^8) = a(z)(f(z)g(z)h(z))^6$ , where  $a(z)$  is a small function with respect to  $f$ ,  $g$  and  $h$ .

**Keywords.** Meromorphic functions, Fermat type functional equations, value distribution theory, complex differential equations.

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