

# Vanishing and Blow-up Solutions to a Nonlinear Complex Differential Equation Near the Singular Point

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A singular nonlinear differential equation  $z^\sigma w'(z) = aw + zwf(z, w)$ , where  $\sigma > 1$ , is considered in a neighbourhood of the point  $z = 0$  located either in the complex plane  $\mathbb{C}$  if  $\sigma$  is a natural number, in a Riemann surface of a rational function if  $\sigma$  is a rational number, or in the Riemann surface of logarithmic function if  $\sigma$  is an irrational number. It is assumed that  $w = w(z)$ ,  $a \in \mathbb{C} \setminus \{0\}$ , and that the function  $f$  is analytic in a neighbourhood of the origin in  $\mathbb{C} \times \mathbb{C}$ . Considering  $\sigma$  to be an integer, a rational, or an irrational number, for each of the above cases, the existence is proved of analytic solutions  $w = w(z)$  in a domain that is part of a neighbourhood of the point  $z = 0$  in  $\mathbb{C}$  or in the Riemann surface of either a rational or a logarithmic function. Within this domain, the property  $\lim_{z \rightarrow 0} w(z) = 0$  is proved. The blow-up phenomenon is discussed. This talk is based on work [1].

## References

- [1] J. Diblík, M. Růžičková, *Vanishing and blow-up solutions to a class of nonlinear complex differential equations near the singular point*, Adv. Nonlinear Anal. 13, no. 1, Paper No. 20230120, 44 pp. (2024)

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