

# Monomial Summability

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In this work, we consider systems of differential equations that are *doubly singular*, i.e. that are both singularly perturbed and exhibit an irregular singular point. If the irregular singular point is at the origin, they have the form

$$\varepsilon^\sigma x^{r+1} \frac{d\mathbf{y}}{dx} = f(x, \varepsilon, \mathbf{y}), \quad f(0, 0, \mathbf{0}) = \mathbf{0}$$

with  $f$  analytic in some neighborhood of  $(0, 0, \mathbf{0})$ . If the Jacobian  $\frac{df}{d\mathbf{y}}(0, 0, \mathbf{0})$  is invertible, we show that the unique formal solution is *monomially summable*, i.e. summable with respect to the monomial  $t = \varepsilon^\sigma x^r$  in a (new) sense that will be defined. Poincaré asymptotics and Gevrey asymptotics in a monomial are studied as well and examples, applications and possible extensions are given.