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9. Ordinary Differential Equations and Dynamical Systems

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Simplest Normal Forms of Differential Equations

Normal form theory plays an important role in the study of differential equations related to complex behavior patterns such as bifurcation and instability. The basic idea of the normal form theory is employing successive, almost linear transformations to find a normal form, which is usually considered as a simplest form. We present examples to show that the conventional method of normal form theory does not generate the simplest form and that, in fact, an appropriate nonlinear transformation may be chosen to further simplify the form. Examples will be used to show how to find the simplest normal forms for a given system of differential equations.