Analysis of a van der Pol Type Differential Equation Having a Nonpolynomial Elastic Term

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The standard van der Pol differential equation provides a model for many important phenomena in the natural and engineering sciences. For this equation the force function is a linear function of the dependent variable; consequently, in the absence of nonlinear terms, the ODE reduces to a damped harmonic oscillator. We consider a modification for which the force function contains terms that are odd, but nonpolynomial in the dependent variable. We use a variety of techniques (energy arguments, phase-space methods, and perturbation procedures) to study the asymptotic behavior of solutions to these van der Pol type ODE's.

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