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#### Abstract

Approximate Solutions to $\mathrm{d}^{2} \mathrm{x} / \mathrm{dt}^{2}+\left[1+(\mathrm{dx} / \mathrm{dt})^{2}\right] \mathrm{x}=0$ Using a Polar Representation 'KALE OYEDEJI, Morehouse College, RONALD E. MICKENS - It can be shown that the following nonlinear differential equation $$
\mathrm{d}^{2} \mathrm{x} / \mathrm{dt}^{2}+\left[1+(\mathrm{dx} / \mathrm{dt})^{2}\right] \mathrm{x}=0
$$ has only periodic solutions. The application of standard perturbation methods, harmonic balance, and other approximation techniques all reach the conclusion that the angular frequency has a singularity for a finite value of the initial amplitude A, where the initial conditions are $\mathrm{x}(0)=\mathrm{A}$ and $\mathrm{dx}(0) / \mathrm{dt}=0$. Since a phase-space analysis demonstrates that such a singularity does not exist, we must seek other methods to give the required valid behavior for the angular frequency as a function or the initial amplitude. This presentation reports our work using a method based on a polar representation for the periodic solutions. We compare these results with a priori calculations and give an explanation as to why the earlier calculations were "interpreted" as being incorrect.


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