Global existence and nonexistence of solutions for second-order nonlinear differential equations

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This talk deals with global existence and nonexistence of solutions of the second-order nonlinear differential equation $(\varphi(x'))' + \lambda\varphi(x) = 0$ satisfying $x(0) = x_0$ and $x'(0) = x_1$, where λ is a positive parameter and $\varphi : (-\rho, \rho) \to (-\sigma, \sigma)$ with $0 < \rho \le \infty$ is an increasing odd bijective function and continuous on $(-\rho, \rho)$. Necessary and sufficient conditions are obtained for the initial value problem to have a unique global solution. The global solution is oscillatory and periodic. Also a nonexistence result for the equation with damping term is discussed as an application to our results.

References

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