KUNGL TEKNISKA HÖGSKOLAN

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Home assignment 5 to be handed in Thursday December 4, 2008

A nonlinear oscillator has the equation

$$\frac{\mathrm{d}^2 y}{\mathrm{d}t^2} + y + \varepsilon y^3 = 0.$$

Find the solution to first order in ε for which (a is a constant)

$$\begin{aligned} y(0) &= a, \\ \frac{\mathrm{d}y}{\mathrm{d}t}(0) &= 0 \end{aligned}$$

by the Poincaré-Lindstedt method.

Hint:

$$\cos^3\alpha = \frac{1}{4}\cos(3\alpha) + \frac{3}{4}\cos\alpha.$$