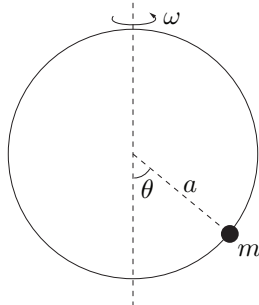


M08M.1 - Bead on a Hoop

Problem

A bead of mass m slides without friction on a circular loop of radius a and mass M . The loop lies in a vertical plane and rotates about a vertical diameter with angular velocity ω .



- Initially, prepare the system in a state such that $\omega = \text{constant}$ and the bead is at some stable equilibrium point $\theta_0(\omega)$. Find $\theta_0(\omega)$.
- Now assume $\omega^2 > g/a$, and move the bead from θ_0 by a small amount $\Delta\theta$. Suppose the bead then undergoes small oscillations around θ_0 . Find the condition under which we can treat the angular velocity approximately as constant.
- Find the frequency of small oscillations.