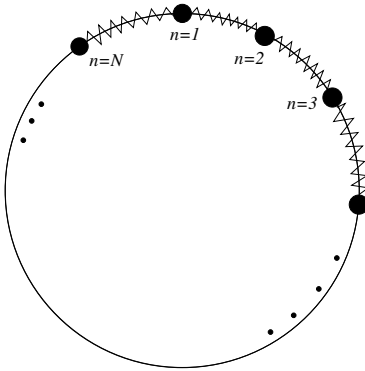


PHY509: HOMEWORK 7. (due 10/31/05)



1. N identical beads of mass m are constrained to slide frictionlessly on a ring of radius R . Each bead interacts with neighboring ones through identical springs with force constant k and natural length a . Choose the angle of each beads with respect to the origin as the generalized coordinates.

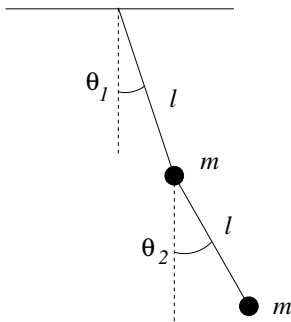
(a) What is the equilibrium spacing between the beads? Assume that N is large that you can approximate the arc as a straight line.

(b) Let the displacement angle of the i -th bead from the equilibrium position be η_i . Find the restoring force corresponding

to a virtual displacement $\delta\eta_i$.

(c) Write down the equation of motion.

(d) Solve the equation of motion for eigenvalues.



P2. A double pendulum is made up of two identical masses and two strings of length l .

(a) In terms of the generalized coordinates given in the figure, write down the Lagrangian.

(b) Solve for eigenvalues for small oscillation.

(c) At $t = 0$, $\theta_1 = \theta_2 = \theta_0$. Solve with this initial conditions to obtain $\theta_1(t)$ and $\theta_2(t)$.