Lagrangian Mechanics 8th Period Problems

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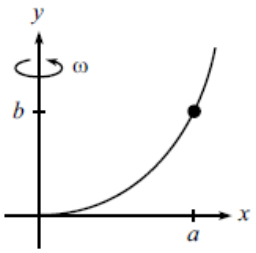
1 Rotating Monomial

The curve $y(x) = b(x/a)^n$ is rotated around the y axis with angular frequency ω. A bead of mass m moves without friction along the curve. Find the frequency of small oscillations about the equilibrium point.

[*D. Morin: Introduction to Classical Mechanics*]



2 Coupled Pendulums

[*Princeton Grad School January 2009 Preliminary Examination*]

Two pendulums are coupled with spring constant k. They each have length l and mass m. The spring is attached at half way down each of the pendulums. Assume for the sake of reasonable calculations (and a solveable differential equation) that θ_1 and θ_2 are both small. What are the equations of motion of the system? (Note the symmetry in the right hand side of the differential equation)