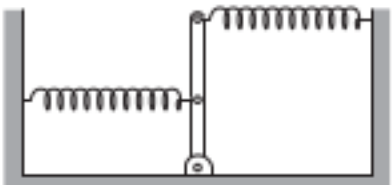
Physics 24a - Section —
Dynamical Systems
Monday, April 4, 2016

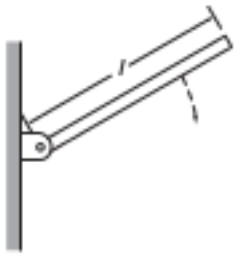
7.{17, 20, 28, 34, 37}

Reading: Chapter 7, sections 7–10.
Nota bene: **the second midterm will be a 3-hour take-home exam, given out 4 April 2016 and due in recitation on Monday, 11 April 2016. It will cover through Chapter 7.**

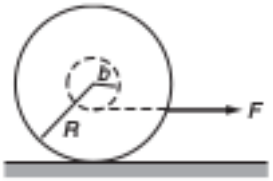
Rod and springs - KK 7.17 A rod of length l and mass m, pivoted at one end, is held by a spring at its midpoint and a spring at its far end, both pulling in opposite directions. The springs have spring constant k, and at equilibrium their pull is perpendicular to the rod. Find the frequency of small oscillations around the equilibrium position. (Don't forget about gravity.)



Falling plank - KK 7.20 A thick plank of mass M and length l is pivoted at one end, as shown. The plank is released at 60^o from the vertical. What is the magnitude and direction of the force on the pivot when the plank is horizontal?



Yo-yo pulled at angle - KK 7.28 The yo-yo of the previous problem is pulled so that the string makes an angle θ with the horizontal. For what value of θ does the yo-yo have no tendency to rotate?



Marble in dish* - KK 7.34 A marble of radius b rolls back and forth in a shallow dish of radius R, where $R \gg b$. Find the frequency of small oscillations.

Plank and ball* - KK 7.37

(a) A plank of length $2l$ and mass M lies on a frictionless table. A ball of mass m and speed v_0 strikes its end as shown. Find the final velocity of the ball, v_f, assuming that mechanical energy is conserved and that v_f is along the original line of motion.

(b) Find v_f assuming that the stick is pivoted at the lower end.