Physics 321
Homework 17

Due at midnight on the day of Hour 18.

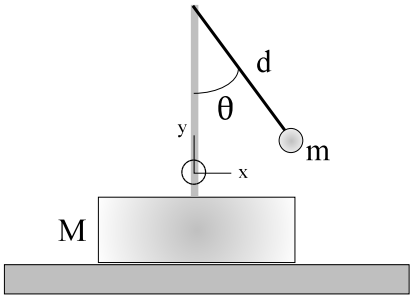
● For more complicated systems, you have to be careful about your expressions for kintetic and potential energy. Each term in the kinetic and potential energy equations must be independent of each other, as we discussed in class.

Problems

1. A small bar of soap with mass m = 125 g is placed in a bowl of hemispherical shape. The soap can slide frictionlessly on the surface of the bowl. The radius of curvature of the bowl is R=50.0 cm. Use a coordinate system where the z axis points upward. (Thus, when the soap is in the bottom of the bowl $\theta=\pi$.) Let the bar of soap be initally at an angle of $\theta=5\pi/6$ (30° up from the bottom of the bowl), be moving up the bowl (theta direction) with a velocity of 2.00 m/s, and be moving around the bowl (phi direction) with a velocity of 1.00 m/s.

Solve the system.

2. A block off mass M slides frictionlessly on an air table. On top of the block is a post that supports a pendulum of length d and mass m. Make a plot of the motion of the cart if the pendulum is raised to an angle θ and released from rest.



Use the following values:
M = 1.24 kg
m = 150 kg
d = 0.300 m
theta0 = 60 degrees

Call the coordinate of the block X with X=0 initially.
Call the coordinates of the pendulum x and y as measued with respect to equilibrium (θ=0) position of the pendulum.

Repeat the calculation for *theta0* = 175 degrees.
See if you can understand the motion of the system.