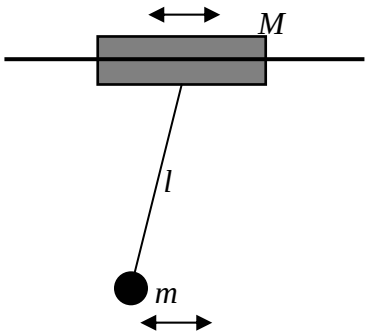
Homework 5

You may not discuss with other people problems 1 and 2. You can consult the textbook and solutions of previous homeworks.
Honor Pledge:_____
Signature:_____

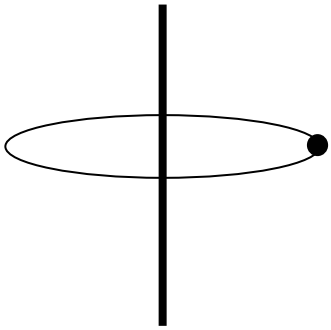
Problem 1



A block of mass *M* is free to slide on a horizontal bar without any friction. A mass *m* is attached to the bottom of the block with a massless rod of length *l* and can oscillate freely in the same plane as the horizontal bar.

Find the frequency of the small oscillations of the system.

Problem 2



It has been proposed that some strings in "String" theory of particle physics are macroscopic and very massive. Consider an infinitely long straight string with a linear mass density λ. A star of mass *M* is in a stable circular orbit around the string with angular momentum *l*.

a) What is the effective potential for the star?

b) What is the radius of the circular orbit?

c) What is the frequency of small oscillations around the circular orbit?

Problems to be worked on collaboratively:

T&M 8.32, 8.35, 8.41