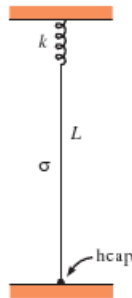


Nutcracker: Physics Problem 2

Dissipative Spring-Mass System

A rope of mass density σ hangs from a spring with spring constant k . In the equilibrium position the bottom part of the rope lies in a heap on the floor, and a length L is in the air. The top of the spring is held fixed.

The rope is raised by a very small distance and then released. What is the amplitude of oscillations as a function of time?



(Assume the following: (1) $L \gg b$, (2) the rope is very thin so that the size of the heap on the floor is very small compared to b , (3) the length of the rope in the initial heap is larger than b , so that some of the rope always remains in contact with the floor, (4) there is no friction of the rope with itself inside the heap, and (5) uniform gravitational field downwards with field strength g . Obtain the approximate answer in the light of these assumptions.)