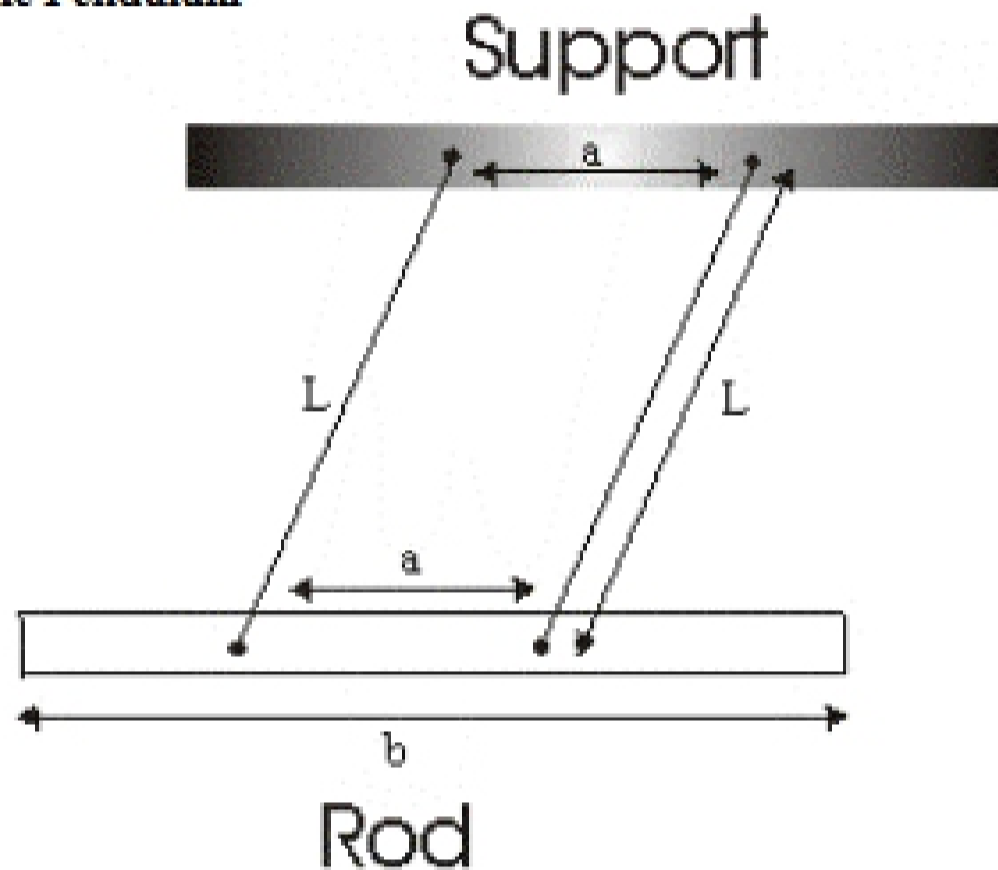


2.004: MODELING, DYNAMICS, & CONTROL II
Spring Term 2003

PLEASE ALSO NOTE THAT ALL PRELAB EXERCISE ARE DUE AT THE START (WITHIN 10 MINUTE) OF THE LAB SESSION, NO LATE WORK IS ACCEPTED.

Pre-Lab Exercise for Experiment 3

(1) Symmetric Pendulum

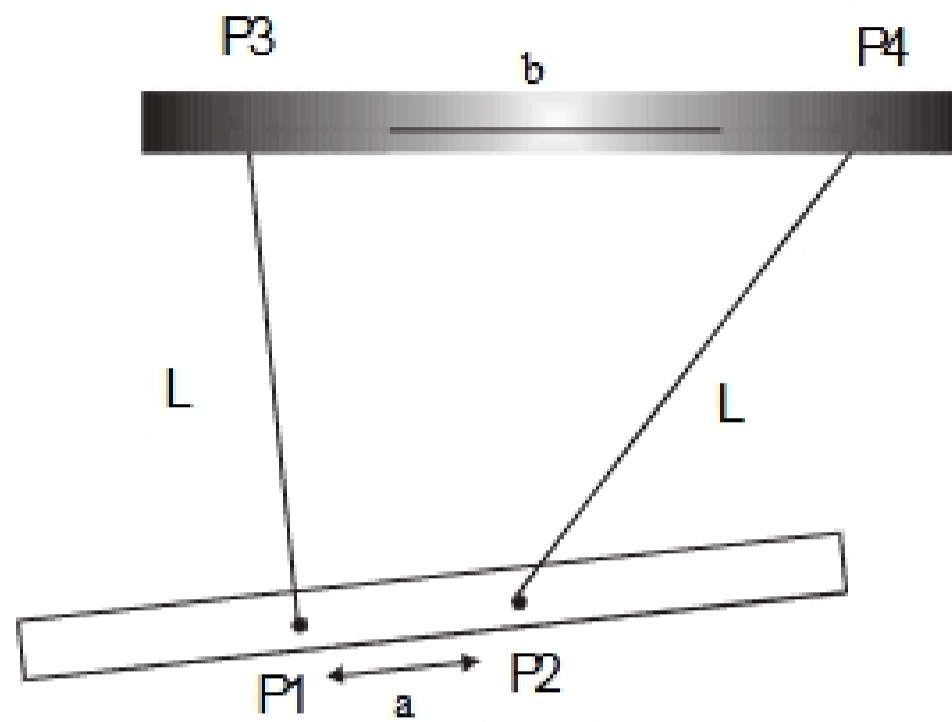


(a) Consider a rod pendulum with length b , mass m , suspended by two tethers with length L as shown above. The tethers are separated by distance, a , at the support surface and at the rod. Write down the equation of motion for the center of mass of the rod and deduce its natural oscillation frequency in the absence of loss mechanisms. You may neglect the mass of the tethers.

(b) Write an equation describing the trajectory of the center of mass as a function of time.

(c) From the solution in part (b), write an equation describing the trajectories of one end of the rod (please pick any one of the ends).

(2) Asymmetric Pendulum



Consider a rod pendulum with mass m , suspended by two tethers with length L as shown above. The tethers are separated by distance, b , at the support surface and separated by distance, a , at the rod. You may neglect the mass of the tethers.

(a) Explain why this system has only one degree of freedom?