

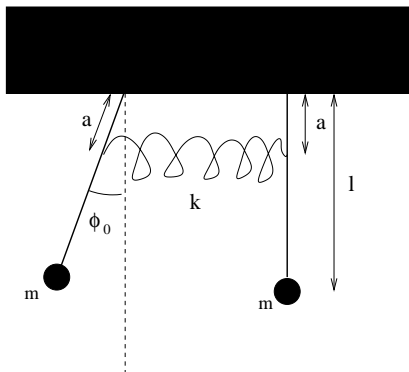
PHY5246
Theoretical Dynamics
Problem Set 10
Due: Monday, Nov 27, 2006

10.1 Problem 6, GPS, Chapter 6, Pg. 272.

10.2 Problem 10, GPS, Chapter 6, Pg. 273.

10.3 Problem 12, GPS, Chapter 6, Pg. 274.

10.4 (From the Spring 1997 Comprehensive Exam.) Two simple pendulums of equal length l and mass m are coupled by a spring with spring constant k , at a distance a from the suspension points, as shown in the figure below. The relaxed length of the spring is equal to the distance between the suspension points so that the pendulums hang vertically when the system is in equilibrium.



The two pendulums are constrained to swing in the vertical plane passing through both suspension points.

- (a) Find the characteristic frequencies for small oscillations for this system.
- (b) Find the corresponding normal modes.
- (c) At $t = 0$ one of the pendulums rests in the vertical direction and the other is lifted so that it makes an angle ϕ_0 with the vertical and is released with zero initial velocity (see figure). Find the subsequent motion of the system.