

Physics 106A - Classical Mechanics

Presentation Problems #5,6

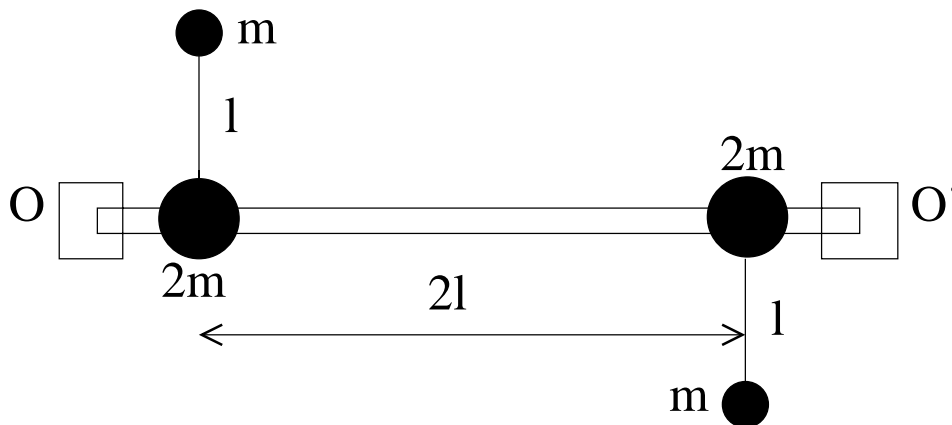
For Tues., Nov. 21 2000 (problem 5) and Tues., Nov. 28 (problem 6)

Assigned to group 5: (problem 5) and group 6 (problem 6)

*Prepare the answer to this problem for presentation to the class. It is your goal not only to solve the problem yourselves, but to explain the solution clearly, in such a way that your colleagues will understand. Be prepared to discuss your reasoning.*

Problem 5: Hand and Finch Chapter 7, problem 11

Problem 6: The figure shows a simple-minded abstraction of a cam shaft, with point masses  $m$  and  $2m$  fixed on massless rods, all in a plane. The shaft rotates with constant angular velocity,  $\omega$ , around the axis  $O - O'$  through the long shaft, held by frictionless bearings at  $O$  and  $O'$ .



- Calculate all elements of the inertia tensor. Be sure to specify the coordinate system you use.
- Using the elements just calculated, find the angular momentum of the cam shaft in the lab frame as a function of time.
- What is the torque with respect to the mid-point of the long shaft exerted by the bearings? Give magnitude and direction in the lab frame.
- Locate an axis, fixed in the plane of the masses around which the cam shaft could rotate with zero torque when the angular velocity is constant.