

UNIVERSITY OF CALIFORNIA, SANTA BARBARA

Department of Physics

Physics 105A

Winter 2012

Prof. Gary Horowitz

TA William Kelly

ASSIGNMENT #8

Due by Friday, March 9 at 5pm in box on first floor of Broida

- 1) Taylor, problem 7.29
  
- 2) Taylor, problem 7.41
  
- 3) Taylor, problem 7.49
  
- 4) Taylor, problem 7.50
  
5. Two small masses  $m$  and  $M$  are connected by a massless string of constant length  $\ell$ . The mass  $m$  is placed on a frictionless table with a small hole in the center. The string is passed through the hole and  $M$  hangs vertically down and only moves in the vertical direction. Consider only motion so long as neither mass passes through the hole. (a) Write down the Lagrangian for this system and derive the equations of motion. (b) What is the angular momentum  $L$  of the system? Is it conserved? (c) What is the condition on  $L$  so that  $m$  moves in a circular orbit at a radius  $r_0$ ?