

HOMEWORK 9 Due date 4/20

1. A gas planet of radius  $R$  consists of an inner core of density  $\rho_1$  extending to a distance  $R/2$  from the center, and an outer, less dense core of density  $\rho_2$  for the remainder. It is found that the acceleration due to gravity "g" is the same at the surface as it is at a distance  $R/2$  from the center. Find  $\rho_1/\rho_2$
  
2. A binary planetary system consists of two planets (consider them to be at rest), one of radius  $2R$  and the other of radius  $R$ , each of the same density. Their centers are a distance  $10R$  apart. Give answers terms of  $G, R$  and  $M$  (mass of smaller planet).
  - a) What velocity is the minimum needed for a projectile leaving the surface of the large planet to reach the small planet?
  - b) What velocity is the minimum velocity it needs to make the return trip?(Note that these are not powered rockets, it is simply a catapult system).