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).