1. Consider an atmosphere of constant density and thickness $H$. Show that the mass of atmosphere above the tangent plane relative to the total mass of atmosphere is $\approx \frac{H}{4R}$, where $R$ is the planet radius and $R >> H$.

2. Consider an initially homogeneous planet of mass $M$ and radius $R$ which subsequently differentiates into a core with a radius $R/2$ and a density twice the final mantle density $\rho$.

   a) Find the bulk density of the initial (homogeneous) planet.

   b) Determine the energy released during differentiation, relative to the self-gravity of the initial body $3GM^2/5R$. 