Oil and Water Don't Mix

Olive oil floats on water. Take $\rho_1$ to be the density of the oil and $\rho_2$ to be the density of the water. Consider an oil-water interface across which a bouillon cube of density $\rho_3$ floats, as shown in the figure below.

(3 points) (a) What is the condition on $\rho_3$ in terms of $\rho_1$ and $\rho_2$ such that the cube floats?

(4 points) (b) If the height of the cube is $H$ and the depth of the bottom of the cube below the oil-water interface is $D$, find $D/H$ in terms of $\rho_1$, $\rho_2$, and $\rho_3$. 