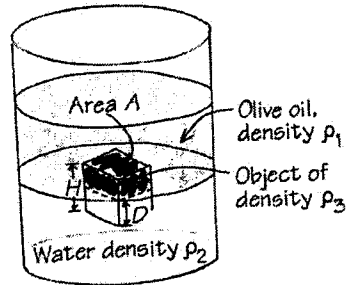


## Oil and Water Don't Mix

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  $\rho_3$ .