Written Preliminary Exam #1
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1. Constant density flow and incompressible flow are two different things. Constant density implies that a fluid(s) density is constant, but capable of changing (through compression or expansion), whereas incompressible implies the fluid(s) density is incapable of changing but that the density in the flow is not constant. A good example from the MAE 560 course to distinguish the two is stagnant air in a room, versus an oil/water mixture. Stagnant air in a room is at constant density, but is certainly capable of both compression or expansion; therefore, it is a constant density flow, but not incompressible. An oil/water mixture is not constant density. As illustrated in figure 1,the water and oil are different fluids with different densities, but the fluids are incompressible because both the water and oil are not capable of compression or expansion (at least in a practical sense); therefore, it not a constant density flow, but is incompressible.

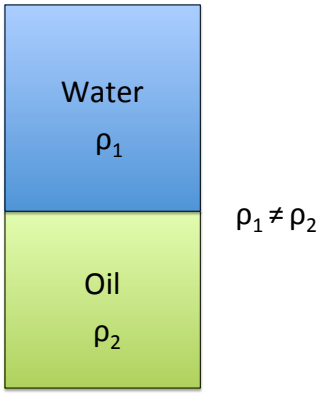

Figure 1: Incompressible Fluid Flow Example

2. There are many ways to derive an expression for change in entropy. From a statistical mechanics perspective, we can derive a function for entropy that is based upon the partition function, Q.