April 13, 2020. Quiz 2, due 5pm, Tuesday 4/14

Quiz problem 1: The entropy is an extensive state function for weakly interacting large systems and both the internal energy and the entropy are homogenuous functions of order 1

$$U(\lambda S, \lambda V, \lambda N) = \lambda U(S, V, N)$$

$$S(\lambda U, \lambda V, \lambda N) = \lambda S(U, V, N)$$

From the entropy equation directly derive the Euler relation

$$S = \frac{1}{T}U + \frac{p}{T}V - \frac{\mu}{T}N$$

and the corresponding form of the Gibbs-Duhem relation:

$$d\left(\frac{\mu}{T}\right) = \left(\frac{U}{N}\right)d\left(\frac{1}{T}\right) + \left(\frac{V}{N}\right)d\left(\frac{p}{T}\right).$$