Thermodynamics & Statistical Mechanics PSet 2

1. **Book Problems:** 1.34, 1.37, 1.38, 1.48, 1.55

2. **How High Can a Mountain Be?** Consider a mountain of height H on a planet with gravitational constant g. How much work W does it take to raise a mass m of rock to the top of this mountain? If you were to perform W on this mass of rock to heat it up, how much would the temperature T change (look up the relevant parameters; any reasonable estimate is sufficient). For what H is the work sufficient to raise the temperature to the melting point? This analysis provides an extremely crude estimate of the maximum height of mountains – if a mountain is taller than H, then the rock at its base will tend to liquify, and the mountain will slowly sink, so mountains shouldn't be taller than $\sim H$. For extra credit, consider the full gravitational potential, and estimate the size scale (the approximate radius) beneath which asteroids can take any (non-spherical) shape. You can think of a non-spherical asteroid as a sphere with a very large mountain on it.

3. **Book Problem Extra Credit:** 1.39, 1.40, 1.50f