

Problem Set 5Due at *beginning* of class *Wednesday, 10 May 1995***Homework Problems:**

1. How fast can grass grow? Consider both wet and dry climates.
2. How many Mbytes of disk space would be required to store all the books and journals ever written? Does this much disk space (let's call it DS) exist, in either localised or distributed form? Large cosmological n-body simulations fill the memory of the Intel Paragon on campus. How long would it take the Paragon to generate an amount of data equal to DS, if one wrote out all the data every 100 time steps? Discuss the difference between useful and useless information.
3. How much warmer is a big city [say 10^7 people in a square 20km on a side] than the surrounding countryside? (Hint: the average American uses 10kWatt). Treat two cases:
 - a) The city is trapped under a breeze-less inversion layer, so all heat must be radiated.
 - b) The heat is convected up into the atmosphere and carried away by horizontal winds.
4. Light bulb filaments are made of refractory metals (e.g. Tungsten) so that when heated enough to radiate at optical wavelengths they don't sublime.
 - a) The resistance of a light bulb measured with a 3 V battery tester is about 10 times lower than it is when measured at 120 V line voltage. Why? Can you think of a consequence from your personal experience?
 - b) Predict the length and thickness of the filament of a 100 W light bulb.