Homework 6, due Nov. 9, 2006

1. Problem 11.1 in book. Here is a nice way to do the integrals: note that $\int_0^\infty e^{-\lambda v} dv = \lambda^{-1}$ (for $\lambda > 0$), and then take $(-1)^n d^n/d\lambda^n$ of both sides to get $\int_0^\infty v^n e^{-\lambda v} dv = (-1)^n d^n(\lambda)^{-1}/d\lambda^n = n!\lambda^{-n-1}$.

2. Problem 11.2 in book.

3. Consider a gas of one kilomole of He atoms, at $T = 300K$ and $P = 1atm$. The mean energy is $\overline{\epsilon} = \frac{3}{2}kT \approx 6 \times 10^{-21}J$. Estimate the number of atoms of this gas whose energy ϵ lies in an interval of width $10^{-22}J$ around this mean value. Hint: use the Maxwell distribution. It's a bit simpler to write it in terms of ϵ for this problem.