Suspensions and polymer solutions

Exercise 7

18 May 2011

- 1. In many applications a polymer in solution is physically adsorbed on a solid surface due to short-range attraction between the monomers and the surface. Assume that the energy of the monomer–surface attraction is $-V_0$ and its range is comparable to the monomer size a. Use scaling arguments to calculate the following:
 - (a) The thickness of the "cushion" that the adsorbed polymer makes adjacent to the surface. If $|V_0| > kT$, will the thickness be larger or smaller for a real chain as compared to an ideal chain? How can you rationalize this result?
 - (b) The free energy of polymer adsorption. (Note the resulting non-trivial dependence of the free energy on temperature.)
- 2. Using scaling arguments calculate the free energy of a polymer squeezed into a tube of diameter $A, a \ll A \ll R_0$, where R_0 is the radius of the unperturbed polymer coil.