Quiz 1 Polymer Physics January 17, 2018

The random walk model for a polymer chain has been associated with an ideal gas.

- a) List similar assumptions involved in the ideal gas model and the random walk model.
- b) Explain the statement: "Both the ideal gas and the random walk chain are governed *strictly by entropy.*"
- c) Derive an expression for force as a function of chain end-to-end distance, R, and compare the expression to the ideal gas law by listing analogous terms, for example force and pressure, PV is energy or work, Fl is energy or work.
- d) The ideal gas law is used to describe *non*-ideal behavior thorough a power-series in concentration (n/V) called the virial expansion. Propose a similar expansion for the ideal chain expression but not in terms of concentration. For the virial expansion concentration increases lead to more atomic interactions, what analogously happens in the *non*-ideal chain expression.
- e) Most polymer melt rheological models rely both on random walk chain statistics and the concept of an entanglement. Discuss how these two models compare.