Homework 2
Polymer Physics 2023
Due Tuesday January 24 at noon
(Please send one email with a **pdf** attachment to beaucag@uc.edu)

Everaers R, Karimi-Varzaneh HA, Fleck F, Hojdis N, Svaneborg C *Kremer−Grest Models for Commodity Polymer Melts: Linking Theory, Experiment, and Simulation at the Kuhn Scale* Macromolecules **53** 1901-1916 (2020) discuss the use of the Kuhn unit as the touch point between coarse grain simulations and experimental data, particularly, n_K which is the number of Kuhn units in a Kuhn volume, l_K^3. The Kremer-Grest model is a bead-spring model that forms the basis of most computer simulations of polymer chains.

a) Equation (5) relates η and ζ. Explain this relationship.

b) Derive equation (6) using $D_K = k_B T/\zeta_K$ and Stokes Law for ζ_K.

c) Explain the origin of equation (11). How does it relate to C_n or C_∞?

d) Derive equation (12).

e) Equation (15) indicates that N_{eK} (number of Kuhn units between entanglements) only depends on n_K, equation (3), since α is a universal constant, 18. Explain both logically and mathematically why this is the case.