Soft Matter Physics

Problems 1: Solutions

The questions and problems are chosen on a first come first served basis.

1. a) Describe and discuss the double tangent construction to the Helmohltz free energy and show that it is equivalent to imposing chemical and mechanical equilibrium between two coexisting phases. Consider both single component systems and incompressible binary mixtures.

b) Solve problem 2.4 of the textbook by Doi.

1. a) Define and discuss the spinodal and the binodal lines for single component systems and incompressible binary mixtures. How do you distinguish the binodal from the spinodal in a simulation and/or experiments ?

b) Solve problem 2.5 of the textbook by Doi.

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b) Solve problem 2.6 of the textbook by Doi.

1. a) Define and discuss the spinodal and the binodal lines for single component systems and incompressible binary mixtures. How do you distinguish the binodal from the spinodal in a simulation and/or experiments ?

b) Solve problem 2.7 of the textbook by Doi.

1. a) Discuss the dynamics of phase separation and distinguish spinodal decomposition from the nucleation regime. Write down the relevant equations for an incompressible solution.

b) Solve problem 2.6 of the texbook by Doi.

1. a) Write down the conditions for stability and metastability of the phases of an incompressible solution. Define the solution critical point and characterize its stability.

b) Solve problem 2.7 of the texbook by Doi.