Below is the sixth homework assignment of the quarter. Please conform to the format described in the class syllabus. This assignment is due on 22 February 2018 at the start of the studio section for which you are registered. If you have any questions, feel free to see me or one of the other instructors during office hours or by appointment.

1. Sets of data for two different binary mixtures are plotted below. On the top are two plots of the liquid phase fugacity coefficient of species $a$ vs. mole fraction of $a$, and on the bottom are plots of activity coefficient of $a$ and $b$ vs. mole fraction of $a$. Take Lewis/Randall reference states for $a$ and $b$. Each of the plots above (I and II) corresponds to a specific plot below.

A. Match the appropriate plot on top with the one on the bottom. Explain.
B. On the plots above (A or B), identify which lines corresponds to $\ln \gamma_a$. Explain.
C. Draw in the lines for $\ln^{\text{Henry's}}_a$ and $\ln^{\text{Henry's}}_b$ on plot A above. Explain your method.

2. Text 7.62
4. The following data are reported for a binary mixture of species 1 and 2 at 30 °C:
   The activity coefficients at infinite dilution are:
   \[
   \ln \gamma_1^\infty = 0.8 \quad \text{and} \quad \ln \gamma_2^\infty = 0.8
   \]
   The saturation pressures of the pure species are:
   \[
   P_1^{\text{sat}} = 75 \text{ [kPa]} \quad \text{and} \quad P_2^{\text{sat}} = 50 \text{ [kPa]}
   \]
   Consider a system where 4 moles of species 1 and 6 moles of species 2 are placed in a closed container and allowed to come to vapor-liquid equilibrium at 30 °C. The liquid mole fraction is measured to be \( x_1 = 0.26 \)

A. For this binary mixture, are the “like” interactions stronger than the “unlike”? Explain
B. What is the value for the Henry’s law constant for species 1?
C. What is the pressure in the system?
D. What is the gas phase mole fraction of species 1?
E. How many total moles of liquid are there in the system?