ChEn 3603 Homework 6

Problem 1 (8 pts)

SHR 2.10 (3^{rd} or 4^{th} edition)

The separation of isopentane from n-pentane by distillation is difficult (approximately 100 trays are required), but is commonly practiced in industry. Using the extended Antoine vapor pressure equation, (2-39), with the constants below and in conjunction with Raoult's law, calculate relative volatilities for the isopen- tane/n-pentane system and compare the values on a plot with the following experimental values [J. Chem. Eng. Data, 8, 504 (1963)]:

Temperature (F)	α_{iC_5,nC_5}
125	1.26
150	1.23
175	1.21
200	1.18
225	1.16
250	1.14

1. (4 pts) Plot the saturation pressure of each species, p_i^s as a function of temperature for the temperature range given. Use temperature in F and pressure in psia.

2. (4 pts) Plot $\alpha(T)$ for the experimental data as well as predictions using Raoult's law. What can you conclude about the applicability of Raoult's law in this temperature range for this binary system?

Be sure to link to the online source where you obtained your Antoine coefficients and report these as well.

Problem 2 (8 pts)

1. (6 pts) Using Figure 2.4 in SHR, generate a plot of the bubble point pressure (in psia) as a function of temperature (in F) for *n*-pentane.

2. (2 pts) According to the figure, which is more volatile, isopentane or normal pentane? Does the same hold for *n*-butane/*i*-butane and *n*-butene/*i*-butene?