ASSIGNMENT 3

CHEMISTRY 200

Due: 4:30 pm Wednesday 24 September 2008

1. Using the scaled dimensionless form of the van der Waals equation, plot ($\mathcal{P}$,$\mathcal{V}$) isotherms at the following scaled temperatures:

   (a) 0.1 (b) 0.2 (c) 8/27 (d) 0.5 (e) 1.0

   Show a sample calculation for $\mathcal{V} = 2.0$ on each isotherm.

2. Derive an expression for the Boyle temperature for the Berthelot equation of state.

3. Consider the critical point data given in the table below:

	p_c (atm)	T_c (K)	$\overline{V}_c$ (cm^3 mol^{-1})
Xe	57.6	289.7	119
NH_3	111.5	405.4	72.5
CO_2	72.7	304.2	94
O_2	49.7	154.6	73.4

   At what $(p, \overline{V}, T)$ are each of Xe, NH_3 and CO_2 in a state corresponding to that of O_2 at $(p, \overline{V}, T)$ = (4.1 $\times 10^4$ Pa, 5.0$\times 10^3$ cm^3 mol^{-1}, 201 K)?