Problem 12.1

The following is a set of VLE data for the system methanol(1)/water(2) at 333.15 K (extracted from K. Kurihara et al., *J. Chem. Eng. Data*, vol. 40, pp. 679–684, 1995):

P/kPa			P/kPa		
P	x_1	y_1	P	x_1	y_1
19.953	0.0000	0.0000	60.614	0.5282	0.8085
39.223	0.1686	0.5714	63.998	0.6044	0.8383
42.984	0.2167	0.6268	67.924	0.6804	0.8733
48.882	0.3039	0.6983	70.229	0.7255	0.8922
52.784	0.3681	0.7345	72.832	0.7776	0.9141
56.652	0.4461	0.7742	84.562	1.0000	1.0000

Table 1: VLE data for methanol(1)/water(2) at 333.15 K.

(a) Basing calculations on Eq. (12.1), find parameter values for the Margules equation that provide the best fit of G^E/RT to the data, and prepare a P-x_1 diagram that compares the experimental points with curves determined from the correlation.

(b) Repeat (a) for the van Laar equation.

(c) Repeat (a) for the Wilson equation.

(d) Using Barker's method, find parameter values for the Margules equation that provide the best fit of the P-x_1 data. Prepare a diagram showing the residuals δP and δy_1 plotted vs. x_1.

(e) Repeat (d) for the van Laar equation

(f) Repeat (d) for the Wilson equation