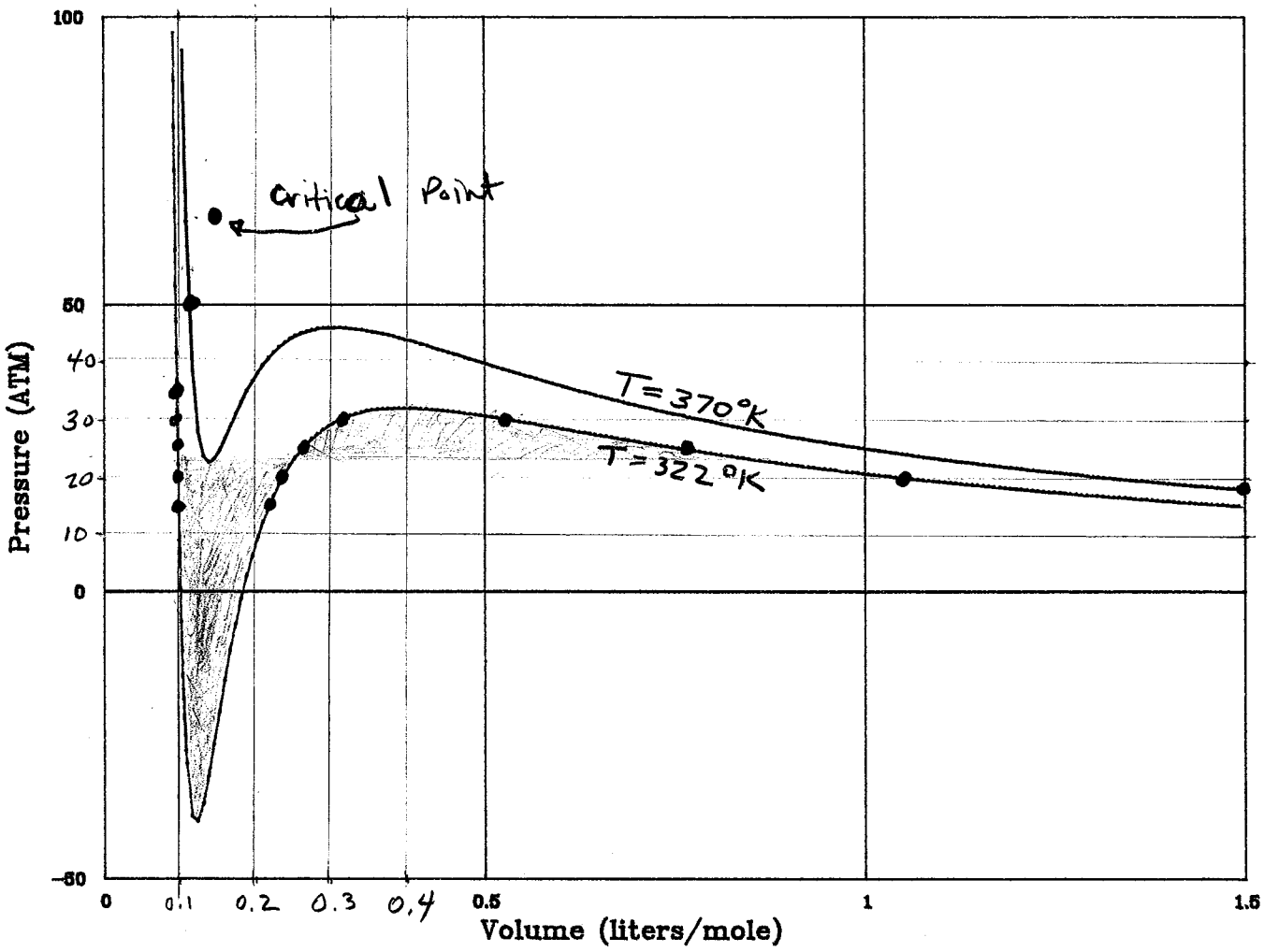
Methyl Chloride

$T_c = 416.3\,^\circ K$
$P_c = 65.9$ atm
$Z_c = .276$



T°K	Patm	Roots		
322	15	1.511	0.098	0.217
"	20	1.053	0.098	0.235
"	25	0.763	0.097	0.261
"	30	0.539	0.097	0.310
"	35	0.096	$[0.362 \pm 0.1140i]$	
370	18	1.484	$[0.1337 \pm 0.0156i]$	
"	50	0.1112	$[0.280 \pm 0.0918i]$	

$$-\int v\,dP = \int P\,dV - \int d(PV) = 0$$

$$\int_{V_L}^{V_G} \left(\frac{RT}{V-b} - \frac{a}{V^2}\right) dV + P^{SAT}(V_G - V_L) =$$

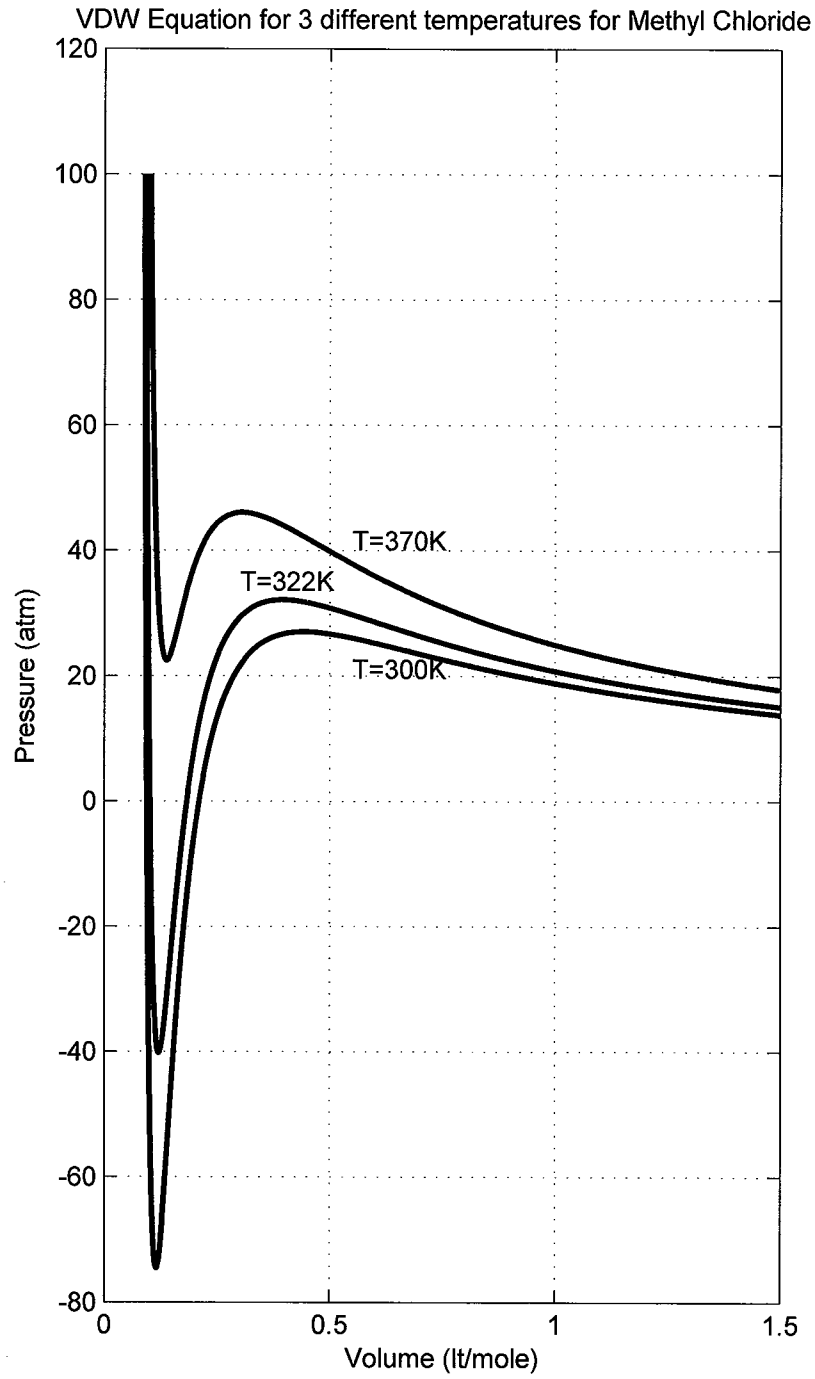
for $T = 322\,^\circ K$, $T_c = 416.3$, $P_c = 65$

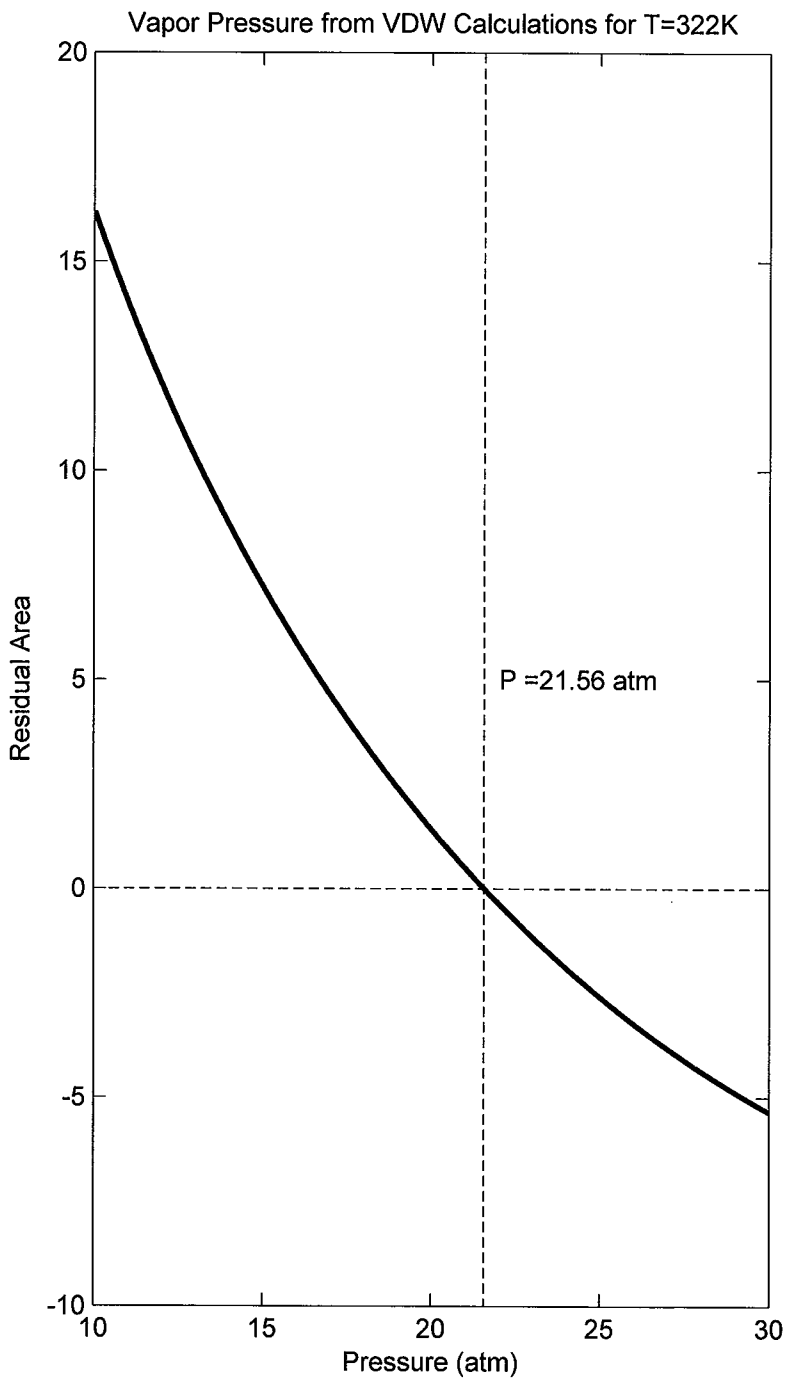
$$26.42 \ln\left[\frac{V_G - b}{V_L - b}\right] + a\left(\frac{1}{V_G} - \frac{1}{V_L}\right) - P^{SAT}(V_G - V_L) = 0$$

Method: Guess P^{SAT}
Compute V_L & V_G from VDW
Evaluate Eqn

For $P = 15$, LHS $= 7.229$
For $P = 20$, LHS $= 1.413$
For $P = 25$, LHS $= -2.596$
For $P = 21.6$, LHS ≈ 0

compare w/ actual $P^{SAT} = 10.49$ atm
Lesson: Don't use VDW for Vapor Pressure


VDW Equation for 3 different temperatures for Methyl Chloride
Pressure (atm)
Volume (lt/mole)
T=370K
T=322K
T=300K
120
100
80
60
40
20
0
-20
-40
-60
-80
0
0.5
1
1.5


Vapor Pressure from VDW Calculations for T=322K
Residual Area
Pressure (atm)
P =21.56 atm
20
15
10
5
0
-5
-10
10
15
20
25
30