Thermodynamics (MP460) Assignment 9

Please hand in your solutions no later than Monday, December 12, 10:05 am. Late assignments will not be accepted. If you have questions about this assignment, please ask your lecturer, Joost Slingerland, (`joost-at-thphys-dot-nuim-dot-ie`), Office 1.7D, Mathematical Physics

Ex. 9.1

The van der Waals gas has equation of state $\left(p + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$, where a and b are constants.

(a) Find $\left(\frac{\partial U}{\partial V}\right)_T$ for this gas.

(b) Assume that for this gas, the specific heat per mol at constant volume, c_V is independent of temperature. Calculate $U(V, T)$

(c) Find the entropy $S(V, T)$

(d) Give a formula relating V and T on the adiabatic curves of this gas.

(e) Find the critical temperature and pressure of this gas
   Hint: read pgs. 72 and 73 of Fermi to get a start. Do not forget to include n.