3. **Van der Waals equation.**

The Van der Waals equation of state is

$$P = \frac{Nk_BT}{V - Nb} - a\frac{N^2}{V^2}$$

for the pressure P of a fluid of N interacting atoms in volume V at temperature T. This models the liquid-gas phase transition and its critical point.

(a) **Briefly** explain the physics represented by each of the two correction terms that Van der Waals added to the ideal gas equation of state (corresponding to the parameters b and a).

(b) The Van der Waals equation models the liquid-gas transition line in the phase diagram of a fluid, and its termination at a critical point. Calculate the parameters at the critical point: the critical pressure P_c, critical temperature T_c, and the critical density $n_c = (N/V)_c$.