Physics 112 - Intro to Statistical and Thermal Physics - Spring 2022
Spoiler Set 01

Problem 1.2 - The van der Waals Equation

(a) Don't try to explicitly solve for the derivatives. Rather, take the derivatives with respect to V on both sides of the van der Waals equation.

Non-dimensionalization

$$P_c = \frac{a}{27b^2}, \qquad V_c = 3Nb, \qquad T_c = \frac{8a}{27k_B b}.$$

Problem 1.3 - Adiabatic Transformations of an Ideal Gas

(a) We basically did this in lecture.

(b) You may want to think about what happens in the frame of reference of the piston first.

(d) The number of collisions should be $\frac{N}{2}\frac{(v_i-u)Adt}{V(t)}$. Be careful! Missing a factor of 2? A particle in the relevant volume but moving to the left will not be able to collide with the piston!

(f) Recall that in part (c) we found dV in terms of dt.

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