[tex27] **Heat capacities of the van der Waals gas**

Consider the van der Waals equation of state for $n = 1\text{mol}$ of a gas:

$$\left(p + \frac{a}{V^2}\right)(V - b) = RT.$$

(a) Show that the heat capacity C_V may depend on T but is independent of V.

(b) Calculate the quantity $C_p - C_V$ as a function of p and V. Verify that $C_p - C_V \to R$ in the ideal gas limit.