Homework Set #1, Due Jan 20

Problem #1
Use $dQ = C_v dT + pdV$ and the Ideal Gas Law $pV = Nk_B T$ to derive the $p, V$ relation for adiabatic expansion. (Note: for the ideal monoatomic gas $C_v = \frac{3}{2}Nk_B$)

Problem #2
Calculate $Q_2, Q_1$ and $W$ for a reversible Carnot cycle expanding from $V_A$ to $V_B$ at temperature $T_2$ and contracting at $T_1 < T_2$. Confirm Carnot’s result for the efficiency of heat conversion to work by an explicit calculation.