PHY215 Homework Derivation "D3" and "D4"

3 points each
Include with your HW3 collection
Due: September 25, 2017

Derivation D3:

In class I showed that for an ideal gas, an adiabatic process leads to:

$$P_f = P_i \left(\frac{V_i}{V_f} \right)^{\gamma} .$$

Please show that

$$T_f = T_i \left(\frac{V_i}{V_f} \right)^{\gamma - 1} .$$

This is in the slides Thermodynamics_3.

Derivation D4:

In class I enumerated the contributions to work done by the gas, heat added, and change in internal energy for an ideal gas undergoing a Carnot cycle. The net change is what I'd like you to show, namely that:

$$\text{net Work done by the gas} = nR(T_2 - T_1) \log \left(\frac{V_B}{V_A} \right)$$

$$\text{net Heat added to the gas} = nR(T_2 - T_1) \log \left(\frac{V_B}{V_A} \right) .$$

I believe you'll need to satisfy yourself that

$$\frac{V_B}{V_A} = \frac{V_C}{V_D} .$$

This is all discussed in the slides Thermodynamics_4.