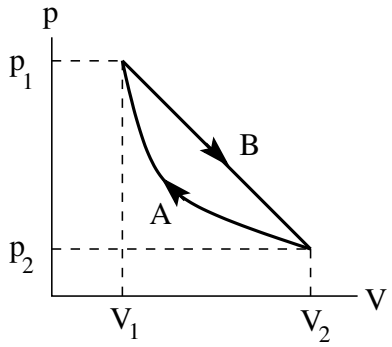
[tex107] Ideal-gas engine with two-step cycle II

Consider the two-step cycle for a classical ideal gas [$pV = Nk_BT, C_V = \alpha Nk_B, \gamma \doteq C_p/C_V = (\alpha+1)/\alpha$] as previously discussed in [tex106]. For the following we assume that the compression ratio is $V_2/V_1 = 2$ and that the gas is monatomic ($\alpha = \frac{3}{2}$).
(a) Show that the net work output along the adiabate and along the straight line segment are $\Delta W_A/p_1V_1 \simeq 0.55506$ and $\Delta W_B/p_1V_1 \simeq -0.65749$.
(b) Show that the total heat absorbed during the cycle is $\Delta Q_{in}/p_1V_1 \simeq 0.39564$.
(c) Determine the efficiency η_2 of the two-step cycle and compare it with the efficiency η_C of the Carnot engine operating between the same two temperatures.



Solution: