[tex8] Idealized Otto cycle

Consider the four steps of the idealized Otto cycle for a classical ideal gas [$pV = nRT$, $U = C_V T$ with $C_V = \alpha nR$].
(a) Determine the heat transfer, ΔQ, the work performance, ΔW, and the change in internal energy, ΔU, for each of the four steps:

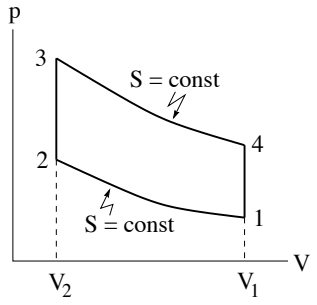
$1 \to 2$ adiabatic compression of air-fuel mixture: $S = \text{const.}$

$2 \to 3$ explosion of air-fuel mixture: $V = \text{const.}$

$3 \to 4$ adiabatic expansion of exhaust gas: $S = \text{const.}$

$4 \to 1$ isochoric release of exhaust gas: $V = \text{const.}$

(c) Calculate the efficiency η and express it as a function of the compression ratio $K \equiv V_1/V_2$.



Solution: