(9) GIVEN

Piston-Cylinder

>> 2 processes A & B, 2 states 1 & 2

>> $p_1 = 10$ bar $= 10 \times 10^5$ Pa, $V_1 = 0.1\ m^3$, $U_1 = 400$ kJ, and $p_2 = 1$ bar $= 1 \times 10^5$ Pa, $V_2 = 1.0\ m^3$, $U_2 = 200$ kJ

>> Processes

* A: 1 → 2 polytropic $PV = \text{const.} = C$
* B: 1 → 3 ($p_3 = 2$ bar $= 2 \times 10^5$ Pa, isovolumetric)
  3 → 2 linear P–V process

>> KE & PE ignored

FIND For each processes A & B

(a) sketch p–V diagram

(b) Evaluate work, kJ

(c) Evaluate $\dot{Q}$ in kJ

EQN

$\Delta Q = \Delta U + \Delta W$

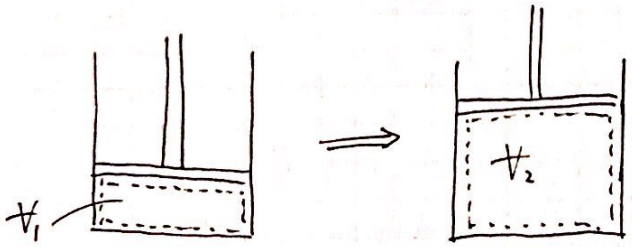
$\frac{dm}{dt}_{sys} = \sum_{in} \dot{m}_{in} - \sum_{out} \dot{m}_{out}$ ($\dot{m} \neq 0$, $\dot{m} \neq 0$, $\dot{m} = 0$)

$W_{boundary} = \int P\,dV$

ASSUMP

- Quasi equilibrium
- steady state
- closed system
- frictionless
- PE = KE = 0

EFD



SOLN

(a)