Question 1

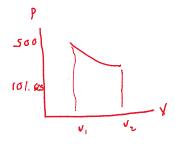*"I pledge my honor I have abided by the Stevens Honor system."*
— Alex Daskins

A spring-loaded piston cylinder device contains 2 kg of steam at 100°C and with a quality (x) of 0.1.
The system is now heated until the temperature rises to 300°C and the pressure equals 500 kPa.

(a) Draw the process on a P-v diagram.

(b) Calculate the amount of boundary work transferred [kJ].

(b) How much heat (if any) was transferred to the system? [kJ].

A.)

B.)

Assume $n \approx 0$

$\dfrac{T_2}{T_1} = \left(\dfrac{V_1}{V_2}\right)^{0-1}$

$W = P_{avg}\left(n\left(V_2 - V_1\right)\right)$

$P = \left(\dfrac{500 + 101.625}{2}\right) = 300.8125$

$3 = \left(\dfrac{V_1}{V_2}\right)^{-1}$

V_2 used table

$W = 300.8125\,(2)\,(.52261 - .3316)\,3 = \left(\dfrac{V_1}{.52261}\right)^{-1}$

$\boxed{W = 114.75 \text{ kJ}}$

$V_1 = .3316$

C.)

$\dfrac{P_1}{P_2} = \left(\dfrac{V_2}{V_1}\right)^n = \dfrac{101.625}{500} = \left(.15\right) \cdot 1^n$

$n = 0.8$

$Q = n\, C_V \left(T_2 - T_1\right)$

$Q = .8\,(.0203)(200)$

$\boxed{Q = 4.98 \text{ kJ}}$