STATE 1 R-134a

$V_1 = 0.01\ m^3$

$P_1 = 0.8\ MPa$

$x_1 = 0.1$

STATE 2

$P_2 = 400\ kPa$

$T_2 = 20°C$

a) $\frac{V_L}{V_1} = \frac{(1-x_1)\, m\, v_{f_1}}{V_1} = \frac{(1-x_1)\, v_{f_1}}{v_1}$

$v_1 = (1-x_1)\, v_{f_1} + x_1\, v_{g_1}$

$v_{f_1} = 0.000846\ m^3/kg$ (interpolation)

$v_{g_2} = 0.02581\ m^3/kg$

$v_1 = 0.003342\ m^3/kg$

p 708

$\frac{V_L}{V_1} = 0.228$

$m = \frac{V_1}{v_1}$

$m = 2.99\ kg$

b) $v_2 = 0.05436\ m^3/kg$

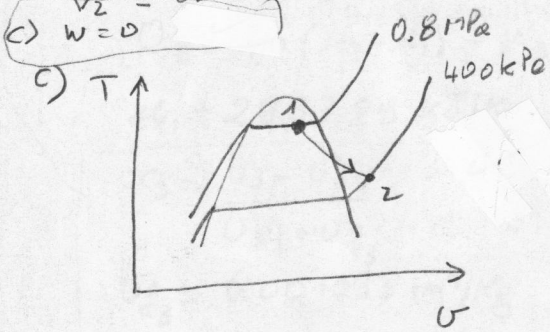
p 711

$V_2 = m v_2$

$V_2 = 0.163\ m^3$

c) $w = 0$

c)



708-711

STATE 1	STATE 2	STATE 3
$P_1 = 1.0\ MPa$	TOUCHING THE STOPS	$P_3 = 500\ kPa$
$T_1 = 400°C$	$P_2 = P_1 = 1.0\ MPa$	$v_3 = v_2 = 0.184\ m^3/kg$
$m = 0.3\ kg$		
$V_{STOP} = 0.6\ V_1$		

a) $v_1 = 0.30659\ m^3/kg$ p 683

$V_1 = m v_1$

$V_1 = 0.092\ m^3$

b) $V_{STOP} = 0.055\ m^3$

$v_2 = \frac{V_{STOP}}{m}$

$v_2 = 0.184\ m^3/kg$

$v_{f_2} < v_2 < v_{g_2}$ at $1.0\ MPa$ p 680

$T_2 = 179.91$

c) $v_{f_3} < v_3 < v_{g_3}$ at $500\ kPa$; $v_3 = v_2$

$T_3 = 151.86\ °C$ p 678

d) $_1W_3 = P_1 m (v_2 - v_1)$

$_1W_3 = -36.78\ KJ$

$_1Q_3 = m(u_3 - u_1) + {}_1W_3$

$u_1 = 2957.29\ kJ/kg$

$x_3 = \frac{v_3 - v_{f_3}}{v_{g_3} - v_{f_3}}$

$v_{f_3} = 0.001093\ m^3/kg$

$v_{g_3} = 0.37489\ m^3/kg$ p 678

$x_3 = 0.49$

$u_{f_3} = 639.66\ KJ/kg$

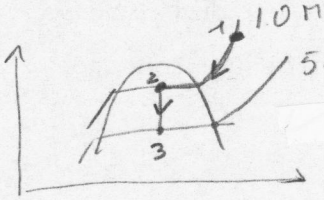
$u_{g_3} = 2561.23\ KJ/kg$

$u_3 = (1 - x_3) u_{f_3} + x_3 u_{g_3}$

$u_3 = 1581.23\ KJ/kg$

$_1Q_3 = -449.6\ KJ$

e)



678 - 683