Prob-1 [10%]
Absolute pressure in tank is $P_1 = 260 \text{ kPa}$ and local ambient absolute pressure is $P_2 = 100 \text{ kPa}$.
If liquid density in pipe is $13600 \text{ kg/m}^3$, compute liquid height, $h = \ldots \text{ m}$? Use $g = 10 \text{ m/s}^2$.

Solution:

\[ \sigma = \rho g = 13600 \text{ kg/m}^3 \times 10 \text{ m/s}^2 = 136,000 \text{ N/m}^2 \]
\[ \Delta P = P_1 - P_2 = 160 \text{ kPa} \]
\[ h = \frac{\sigma}{\Delta P} \]
\[ h = \frac{160,000 \text{ N/m}^2}{136,000 \text{ N/m}^2} = 1.18 \text{ m} \]
Prob-2 [20%]
Find the missing properties of $T$, $P$, $v$, $u$ and $x$ if applicable and plot the location of states as point in T-v and P-v diagrams below?
   a) Water at 250 °C, $u=1800$ kJ/kg
   b) R 134a at 75 °C, $P=1200$ kPa,
Prob-3[30%]
A Piston cylinder system initially contains $m=8\text{ kg}$ of water at $120\ ^\circ\text{C}$ with a volume of $V_1=2\text{ m}^3$.
Heat is added into system and piston moves up until when heating stopped at the final state. Volume at final state is; $V_2=6\text{ m}^3$.

a) Compute specific volumes $[v_1=\text{?},\ v_2=\text{?}]$ at initial state and at final state. **Plot states at P-v diagram below.**
b) Compute amount of heat has been added into system and work done by system on environment?
c) If diameter of cylinder is $D = 1.00\text{ m}$ and local ambient absolute pressure is $P = 100.5\text{ kPa};$ compute mass of the piston?

\[Q=9091.6 + 794-9885.6\text{ KJ}\]
Prob-4

A piston cylinder arrangement with linear spring acting on the piston contains R-134a at 15 °C, x = 0.6 and a volume of 0.02 m³. It is heated up to 60 °C at which point the specific volume is 0.03002 m³/kg.

a) Find the final pressure.  b) Find the final volume

c) Find the work in the process.  d) Find the heat transfer in the process