Do problems 4 and 5 for Tuesday

New PPT is set up today due to Thursday's property determinations using tables.

2. Properties for fixed state:

- Two-phase substances: T, P, u
- Given T and u, or P and u
  0. Look up U_T, U_g @ T (or P)

- Easier (approximate) method:
  - Liquids are (very nearly) incompressible
  - i.e., hold T constant, change P on liquid U stays n constant.

- So... U of a liquid is a function of T only!
  - U(T, P) ∼ U(T) = U(T)
  - Example: U(50°C, 200 kPa) ∼ U(T)

- Gun P and T to find U:
  1. Determine phase:
     - Look up T_{sat} @ P
  2. T > T_{sat} → SH
  3. T < T_{sat} → Comp. Liquid
     - U ∼ U(T)
  4. T = T_{sat}(P) → Subcritical!

- Can get volume from T and P for a set mix.
  - Would need quality to get U

- 22.10^6 \text{ Pa} = 101.10^5 \text{ Pa} + 1000 \frac{\text{K}}{\text{m}^3} \cdot 0.815 \frac{\text{K}}{\text{m}^3}

- Processes go from one set to a final state.

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Problem:

U = 0.6, P = 550 kPa

- U_f ≤ U ≤ U_g → Set mix
  \[ P = P_{sat}(T) \text{ or } T = T_{sat}(P) \]
  \[ U = U_f, \quad x(U_g - U_f) \quad \text{mixing rule} \]

- X = \frac{U - U_f}{U_g - U_f}

- U ≤ U_f → Comp. liquid
  - Could use comp. liquid tables

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Question 4:

(a) What is the initial pressure and quality (if applicable) of the water?

(b) Heat is now added to the container and the temperature increases. The process stops when the water exists as a single phase. What is the final pressure?

To solve part (b), you need to recognize the type of process going from the initial to the final state. What property stays constant?

- Initial state:
  - Gun T_i = 30°C, \( u_i = \frac{V}{M} = 0.1^{\frac{53}{3}} \)

- Process: heat is added.
  - \( u_f = 0.1^{\frac{53}{3}} \)