

PROBLEM 3.91

H₂O at p = 200 bar, T = 470 °C = 743 K

$$(a) \left. \begin{aligned} P_R = P/P_c = 200 \text{ bar} / 220.9 \text{ bar} = 0.905 \\ T_R = T/T_c = 743 \text{ K} / 647.3 \text{ K} = 1.15 \end{aligned} \right\} \text{ Fig A-1} \quad Z \approx 0.79 \leftarrow Z_{\text{chart}}$$

(b) Table A-4 at p = 200 bar, T = 470 °C ⇒ v = 0.1355 m³/kg

$$Z = \frac{Pv}{RT} = \frac{(200 \text{ bar})(0.1355 \text{ m}^3/\text{kg})}{\left(\frac{8.314}{18.02}\right) \frac{\text{kJ}}{\text{kg K}} (743 \text{ K})} \left| \frac{10^5 \text{ N/m}^2}{1 \text{ bar}} \right| \left| \frac{1 \text{ kJ}}{10^3 \text{ N}\cdot\text{m}} \right|$$

$$= 0.791 \leftarrow Z_{\text{table}}$$