

PROBLEM 3.45 Water is the substance

(b) $p = 20 \text{ lbf/in}^2, v = 16 \text{ ft}^3/\text{lb}$

Table A-3E $v_f < v < v_g$
 $\Rightarrow T = 227.96^\circ\text{F}$

$$x = \frac{v - v_f}{v_g - v_f}$$

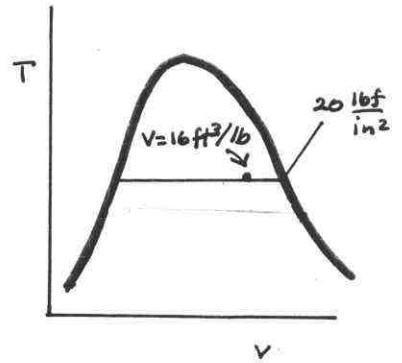
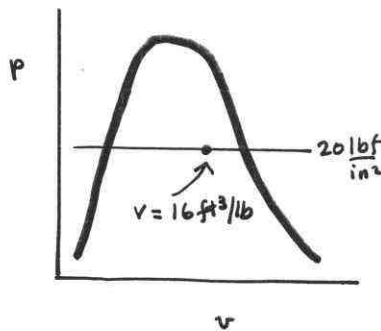
$$= \frac{16 - 0.01683}{20.09 - 0.01683}$$

$$= 0.796$$

$$u = u_f + x(u_g - u_f)$$

$$= 196.19 + 0.796(1082 - 196.19)$$

$$= 901.29 \text{ Btu/lb}$$



IT Results; $T = 228^\circ\text{F}, x = 0.7962, u = 901.3 \text{ Btu/lb}$

(c) $T = 900^\circ\text{F}, p = 170 \text{ lbf/in}^2$

Table A-4E, interpolate at 900°F

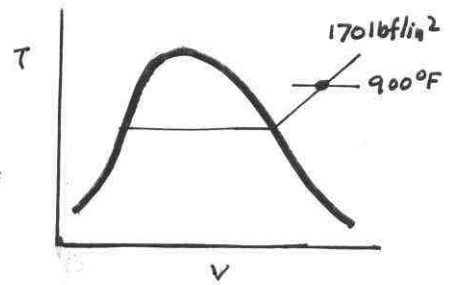
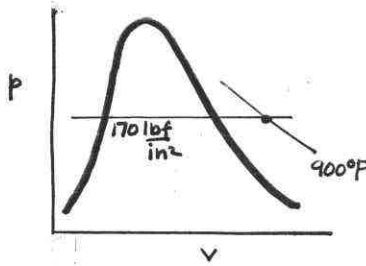
$$v = 4.734 \text{ ft}^3/\text{lb}$$

$$h = 1478.05 \text{ Btu/lb}$$

IT Results

$$v = 4.718 \text{ ft}^3/\text{lb}$$

$$h = 1478 \text{ Btu/lb}$$



(d) $T = 600^\circ\text{F}, v = 0.6 \text{ ft}^3/\text{lb}$

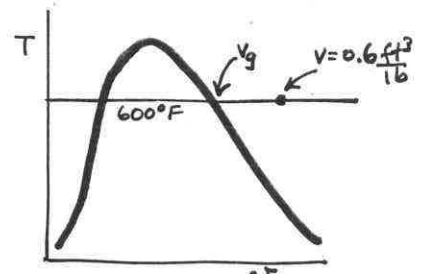
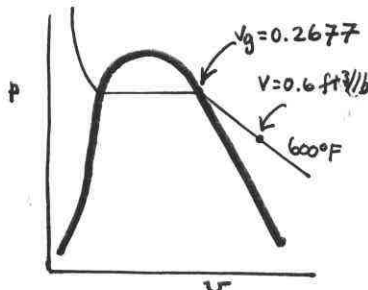
Table A-2E, $v > v_g$ at 600°F .

\Rightarrow Table A-4E. At 600°F the state falls between 800 and 900 lbf/in^2 .

Interpolating,

$$p = 885.6 \text{ lbf/in}^2$$

$$u = 1163.34 \text{ Btu/lb}$$



IT Results; $p = 884.3 \text{ lbf/in}^2, u = 1163 \text{ Btu/lb}$

(g) $T = 40^\circ\text{F}, v = 1950 \frac{\text{ft}^3}{\text{lb}}$

Table A-2E $v_f < v < v_g$ at 40°F . Thus, $p = 0.1217 \text{ lbf/in}^2$

$$x = \frac{v - v_f}{v_g - v_f} = \frac{1950 - 0.016}{2445 - 0.016}$$

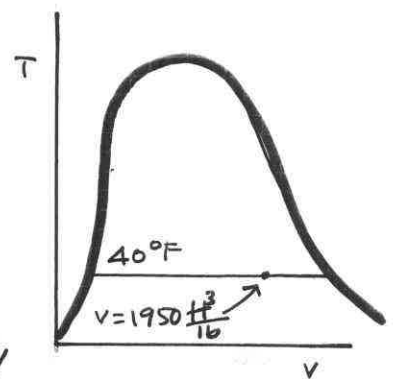
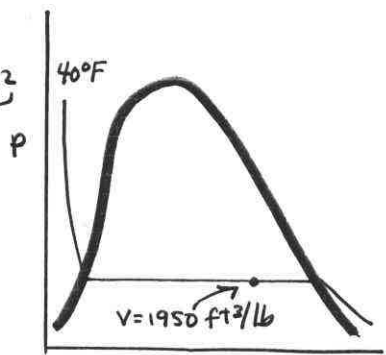
$$= 0.798$$

$$h = h_f + x h_{fg}$$

$$= 80.2 + 0.798(1070.9)$$

$$= 862.6 \text{ Btu/lb}$$

IT Results; $p = 0.1217 \text{ lbf/in}^2, x = 0.7975, h = 861.9 \text{ Btu/lb}$



PROBLEM 3.45 (continued)

(h) $p = 600 \text{ lbf/in}^2$; $T = 320^\circ\text{F}$

Table A-3E at 600 lbf/in^2

$T_{\text{sat}} = 486.33^\circ\text{F}$

\Rightarrow liquid state

Table A-5E - double interpolation

	$p = 500 \text{ lbf/in}^2$	$p = 1000$
$T = 300^\circ\text{F}$	$v = 0.017416$ $u = 268.92$	0.017379 268.24
$T = 400$	$v = 0.018608$ $u = 373.68$	0.018550 372.55

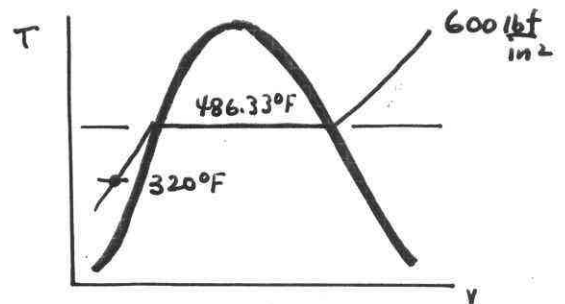
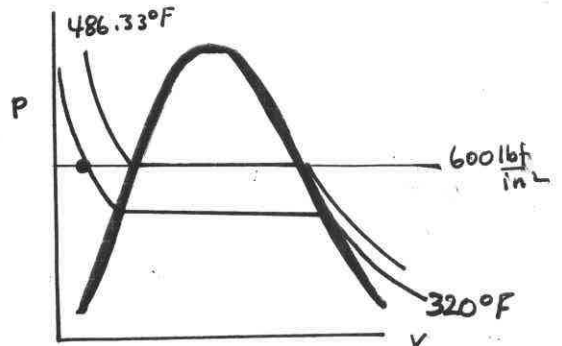
\swarrow
 at 600 lbf/in^2

300°F	$v = 0.017409$ $u = 268.78$
400°F	$v = 0.018596$ $u = 373.45$

Then, at 600 lbf/in^2 , 320°F

$$v = 0.017646 \text{ ft}^3/\text{lb}$$

$$u = 289.71 \text{ Btu/lb}$$



IT Results

$$v = 0.01766 \text{ ft}^3/\text{lb}$$

$$u = 288.3 \text{ Btu/lb}$$