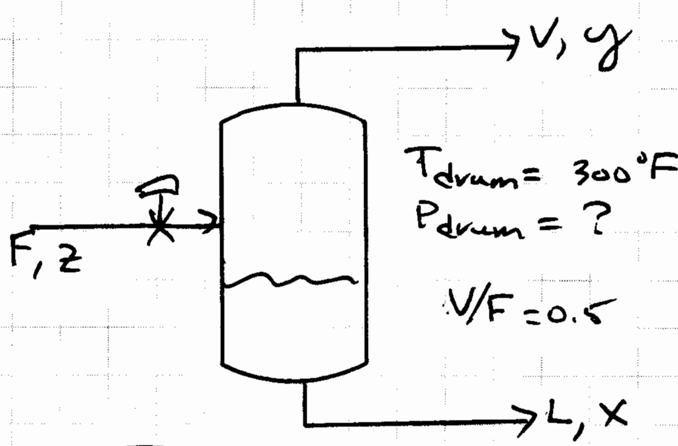
DATE	EXP. NUMBER	EXPERIMENT	03
NAME PLACEK		LAB PARTNER PROB 1	WITNESS



$T_{drum} = 300°F$

$P_{drum} = ?$

$V/F = 0.5$

Find P_{drum}

Given: $T_{drum} = 300°F$

$V/F = 0.5$

$A = n\text{-}C_6$ $\quad B = n\text{-}C_8$

$F_A = 100$ mole $\quad F_B = 60$ mole

$\therefore z_A = \frac{100}{160} = 0.625$

$z_B = \frac{60}{160} = 0.375$

Must use Fig 2.8 Data

$\therefore$ Can generate K_i values for assumed P @ known T_{drum}.

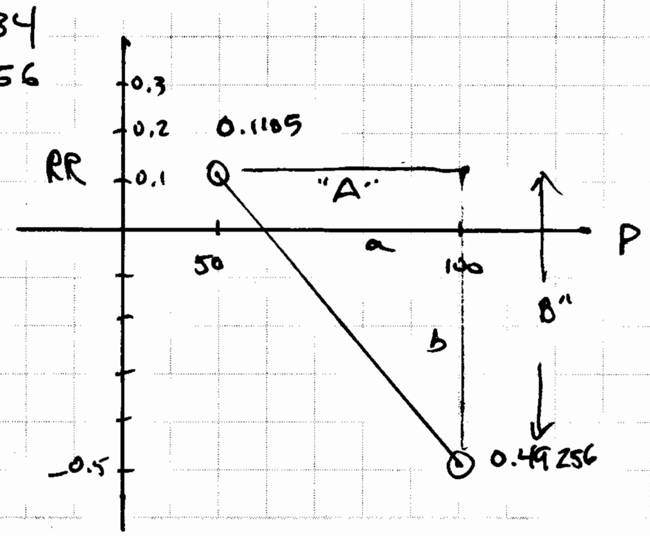
! Need location of n-C_8 (that is, NBP for substance axis)
Can use Fig 2.4 @ 1 atm (see FG).

$T_{NBP}(n\text{-}C_8) = 260°F$

Sequential method similar to B.2 (given V/F) except
$P_{drum} \longleftrightarrow T_{drum}$.

$\therefore$ Assume P_{drum}, get K_i's, check in RR

P	KA	KB	RR (see sep sheet)
50 psia	1.9	0.46	0.110534
100 psia	0.92	0.26	−0.49256



$\frac{A}{B} = \frac{a}{b} = \frac{50}{0.603} = \frac{a}{0.49256}$

$\therefore a = 40.84 \quad a' = 1 - a = 9.16$

$\therefore P \simeq 59.16$ psia

NOTE: INSERT COVER UNDER YELLOW SHEET BEFORE WRITING AND PRESS FIRMLY. THE JONES AND BARTLETT PUBLISHERS OFFICIAL LABORATORY RESEARCH NOTEBOOK

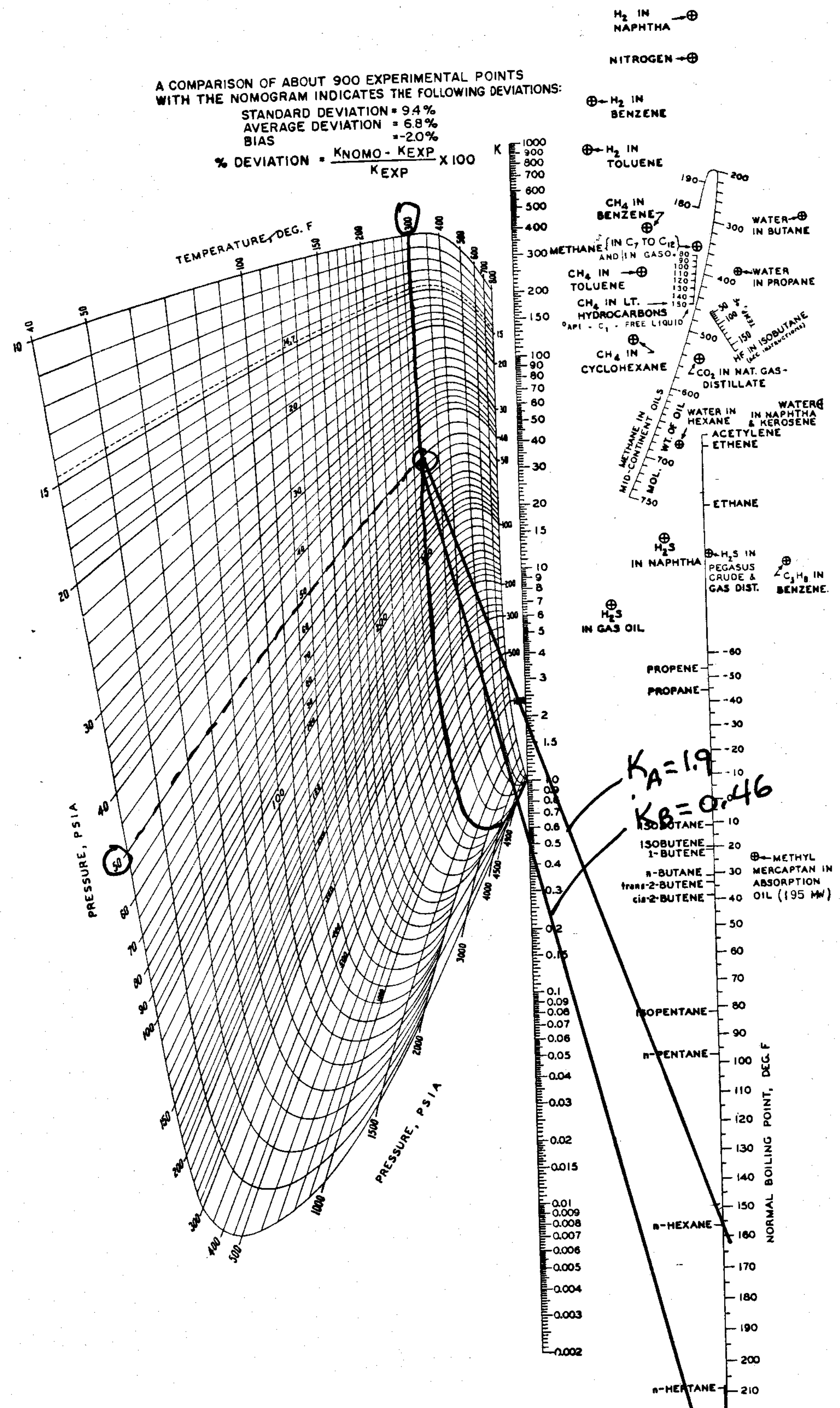


Figure 2.8 Vapor–liquid equilibria, 40 to 800°F. [From S.T. Hadden and H.G. Grayson, *Hydrocarbon Proc. and Petrol. Refiner,* **40,** 207 (Sept. 1961), with permission.]

nC_8 260

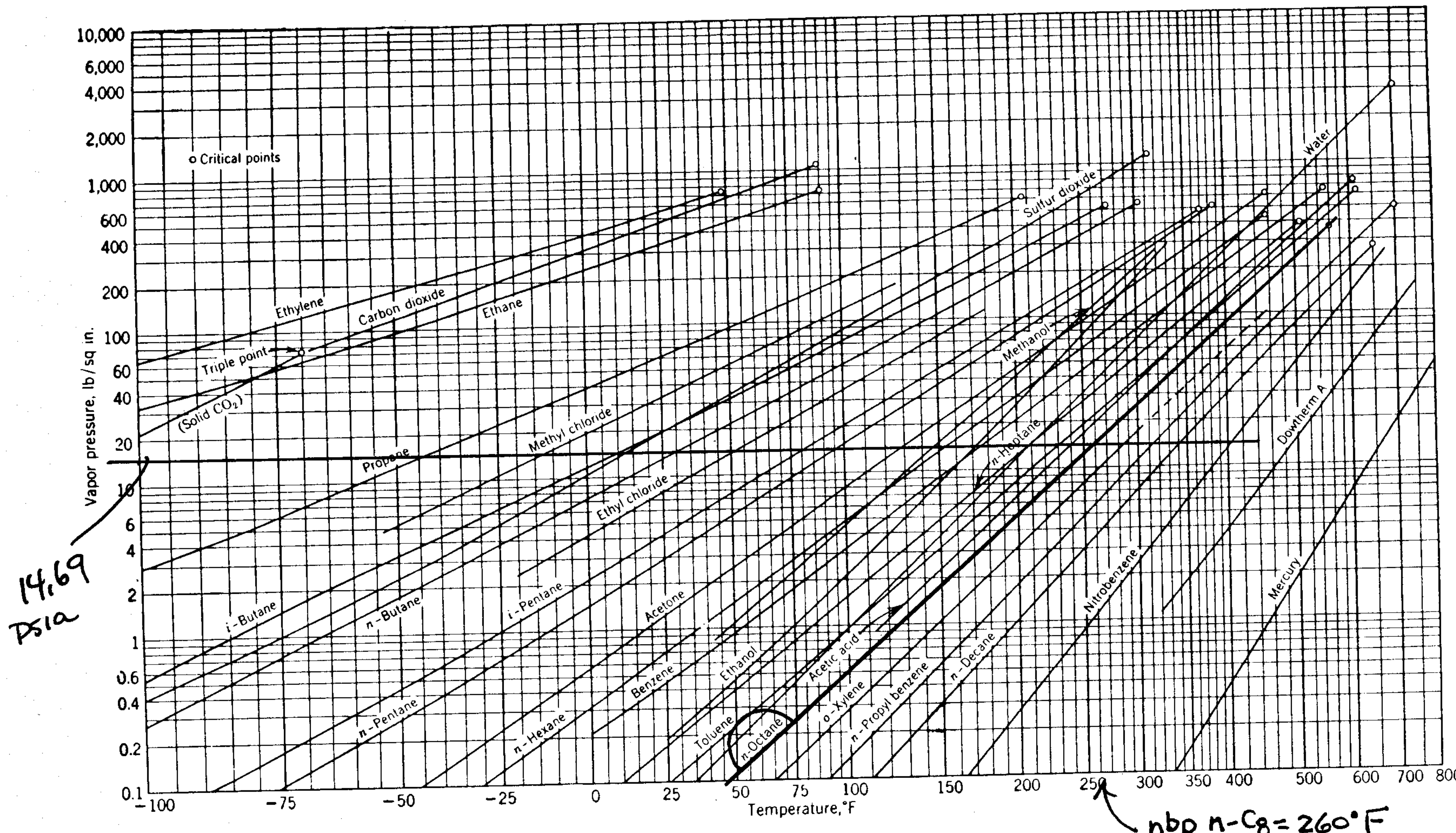


Figure 2.4 Vapor pressure as a function of temperature. [Adapted from A.S. Faust, L.A. Wenzel, C.W. Clump, L. Maus, and L.B. Andersen, *Principles of Unit Operations,* John Wiley and Sons, New York (1960).]

$\boxed{2}$ $A = nC_6$ $B = nC_8$

$z_A = z = 200/(200+800) = 0.2$

(a) Find h_f @ $z = 0.2$ w/ $T_f = 300$ where the state is "subcooled liquid" at an unknown P.

Need to extend available liquid enthalphy data as discussed in class

Method (1) prepare aux curve (h_f vs T @ $z = 0.2$)

Method (2) Draw by estimation, additional lines.

See figure 3.26

(a) $h_F = 20{,}500$ Btu/lbmole

(b) Find x, y (figure 3.26 again)

$x = 0.11$
$y = 0.36$ @ $T_{drum} \simeq 240°F$ @ 1 atm

(c) Find L & V (use material balance)

$F = 200 + 800 = 1000.$

$$\frac{L}{F} = \frac{0.36 - 0.20}{0.36 - 0.11} = 0.64 \quad \therefore \quad \begin{aligned} L &= 640 \text{ lb mole} \\ V &= 360 \text{ lb mole} \end{aligned}$$

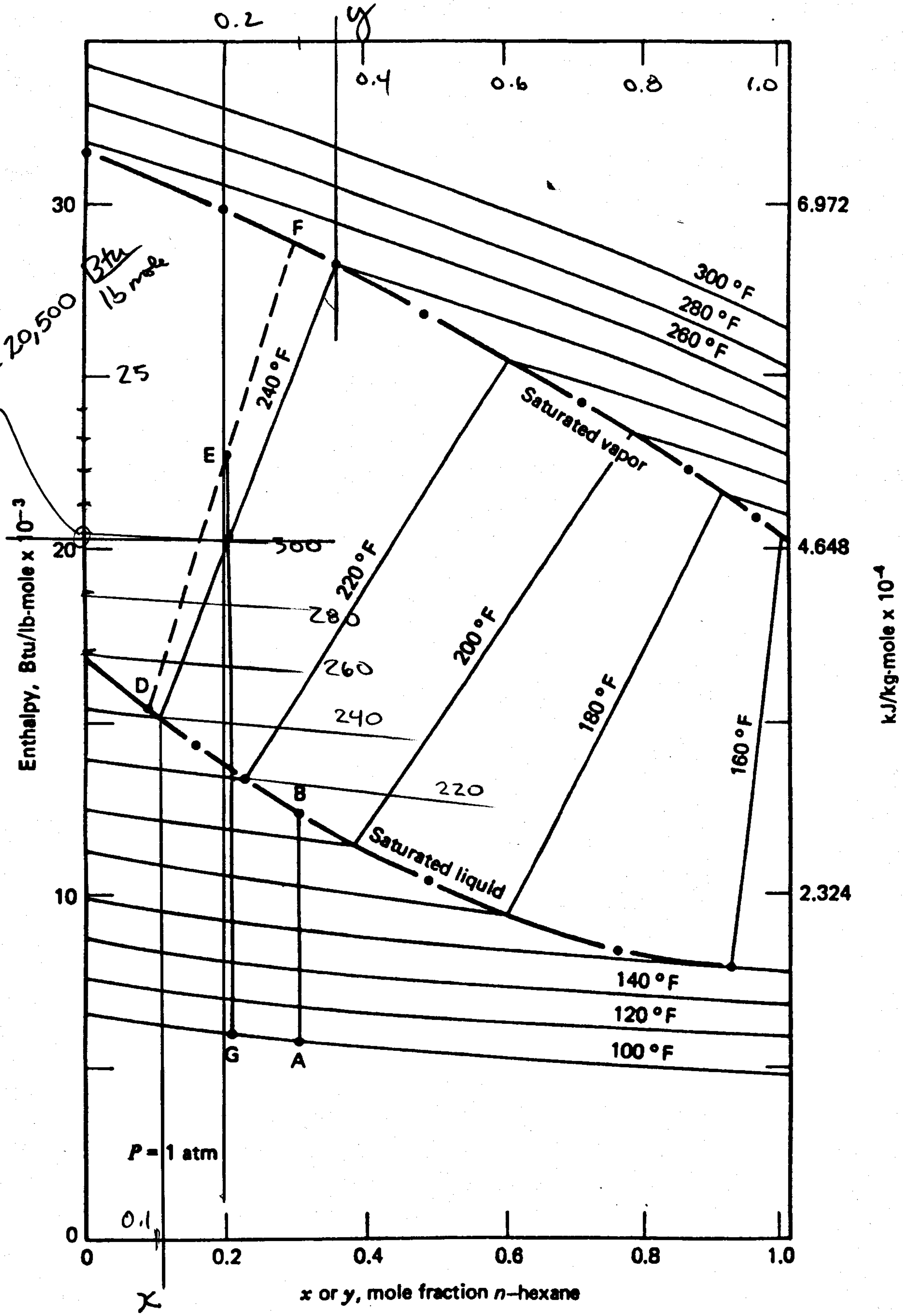


Figure 3.26. Enthalpy concentration diagram for *n*-hexane/*n*-octane.

$\boxed{3}$ Find P_A^s & P_B^s $A =$ ethanol $B =$ water.

System is at equilibrium @ 180°F, 1 atm

$\therefore$ $x = 0.26$ $y = 0.57$

$$K_A = \frac{y}{x} = \frac{0.57}{0.26} = 2.192 = \frac{P_A^s}{P} \quad \text{(ideal)}$$

$$K_B = \frac{1-y}{1-x} = \frac{0.43}{0.74} = 0.58 = \frac{P_B^s}{P}$$

Since $P = 1$ atm

(a) $P_A^s = 2.192$ atm

$P_B^s = 0.58$ atm

(a)

(b) Find % error.

Use graph of actual Vp @ T = 180° F

$P_A^s =$ 18 psia $=$ 1.224 atm

$P_B^s =$ 7 psia $=$ 0.476 atm

$$\text{Error in } P_A^s = \frac{2.192 - 1.224}{1.224} = +\ 79.08\ \%$$

$$\text{Error in } P_B^s = \frac{0.58 - 0.476}{0.476} = +\ 21.84\%$$

(b)

y= 0.57

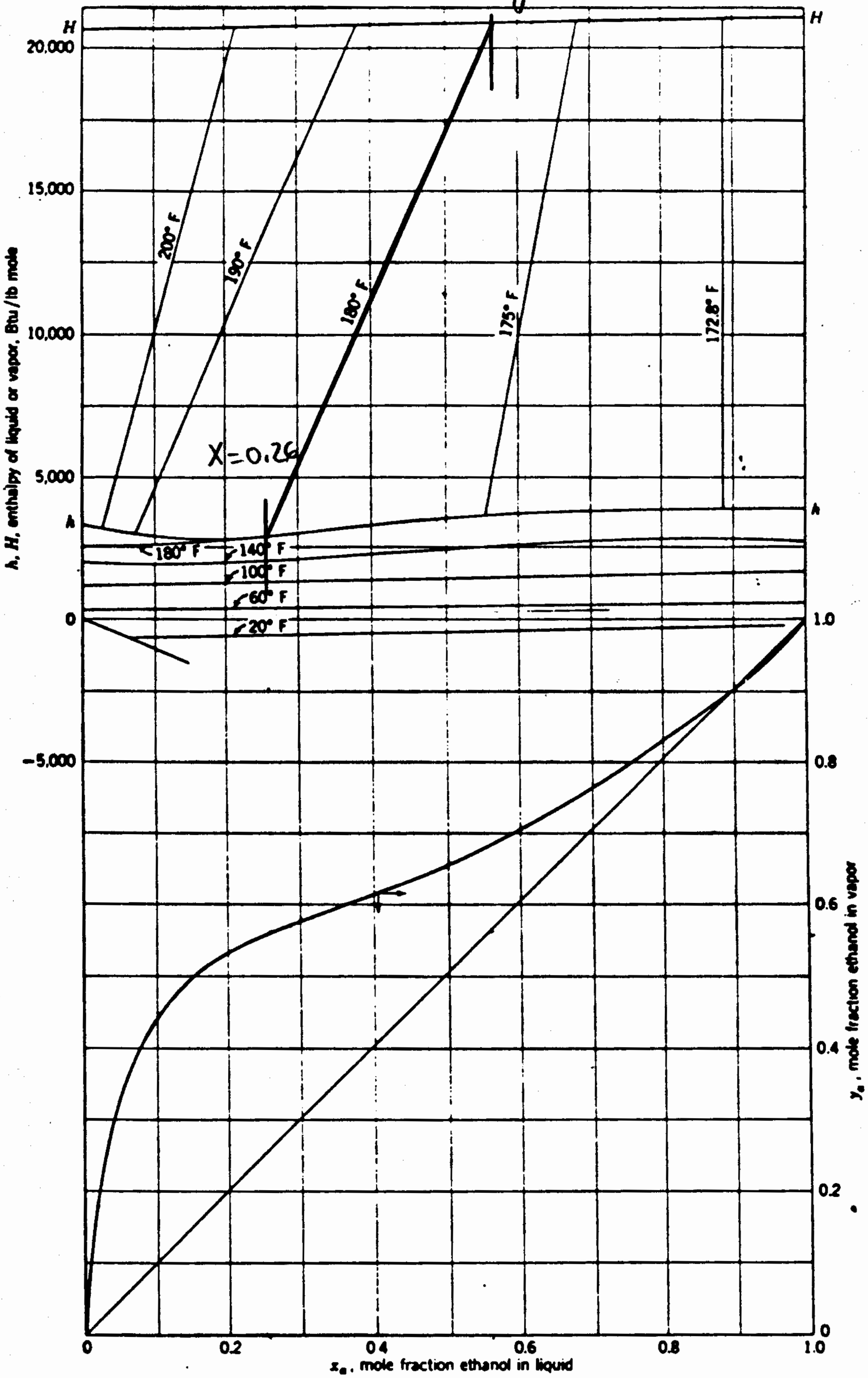


Figure 3.4. Enthalpy-composition diagram for ethanol-water mixtures at 1 atm pressure (3). Reference state: liquid water at 32°F, liquid ethanol at 32°. (By permission of John Wiley; copyright © 1950.)

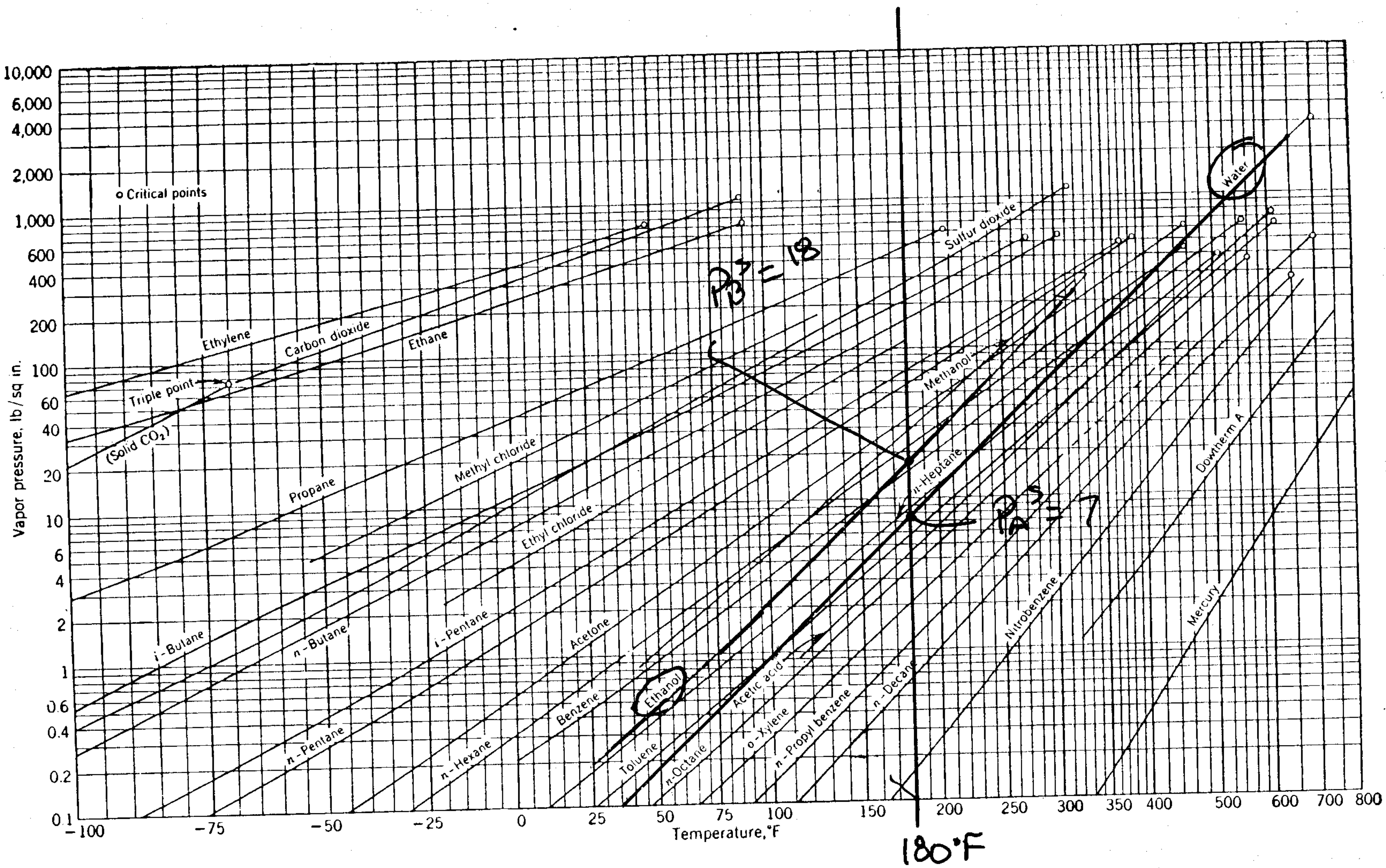


Figure 2.4 Vapor pressure as a function of temperature. [Adapted from A.S. Faust, L.A. Wenzel, C.W. Clump, L. Maus, and L.B. Andersen, *Principles of Unit Operations*, John Wiley and Sons, New York (1960).]