13.68. This problem is similar to above so you need to be using the same eqns.

13.68 (a) Because C_6H_6 and C_7H_8 form an ideal solution, we can use Raoult's law. Because both components are volatile, both contribute to the total vapor pressure of 35 torr.

$$P_t = P_{C_6H_6} + P_{C_7H_8};\ P_{C_6H_6} = X_{C_6H_6} P^o_{C_6H_6};\ P_{C_7H_8} = X_{C_7H_8}\ P^o_{C_7H_8}$$

$$X_{C_7H_8} = 1 - X_{C_6H_6};\ P_T = X_{C_6H_6}\ P^o_{C_6H_6} + (1 - X_{C_6H_6})\, P^o_{C_7H_8}$$

$$35 \text{ torr} = X_{C_6H_6}(75 \text{ torr}) + (1 - X_{C_6H_6})\, 22 \text{ torr}$$

$$13 \text{ torr} = 53 \text{ torr}\ (X_{C_6H_6});\ X_{C_6H_6} = \frac{13 \text{ torr}}{53 \text{ torr}} = 0.2453 = 0.25;\ X_{C_7H_8} = 0.7547 = 0.75$$

382

Part (a): Want the mole fractions of the solute and solvent in the liquid phase given the VP of the two volatile components and the total VP above the soln. Think about the eqn for total VP above a soln of two volatile components.

$$P_T = X_A P^o_A + X_B P^o_B$$ total pressure above a soln for two volatile substances

This eqn has 5 variables. Given four of them we can solve for the remaining one. We want the mole fractions given the vapor pressures of the pure substances and the total VP above the soln.

Remember, mole fractions add up to 1.

$$X_B = (1 - X_A)$$

Substitute this in the eqn for the total pressure,

$$P_T = X_A P^o_A + (1-X_A)\, P^o_B$$

This can be solved for X_A and then get X_B from $1-X_A$.

Part (b): Similar to 13.67(c) so I won't go through it again here.