

ME 3007 – HW #5

1. Prove that an equilibrium liquid/vapor system described by Raoult's Law cannot exhibit an azeotrope.
2. A binary system of species 1 & 2 consists of vapor and liquid phases in equilibrium at temperature T , for which $y_i P = x_i \gamma_i P_i^{\text{sat}}$ and $\ln \gamma_1 = 1.8 x_2^2$, $\ln \gamma_2 = 1.8 x_1^2$, $P_1^{\text{sat}} = 1.24$ bar, and $P_2^{\text{sat}} = 0.89$ bar.
 - a) For what range of values of the overall mole fraction z_1 can this two-phase system exist with a liquid mole fraction $x_1 = 0.65$?
 - b) What is the pressure and vapor mole fraction y_1 within this range?
 - c) What are the pressure and composition of the azeotrope at temperature T ?