6.8 Calculate the temperature at which the vapor pressure of n-decane corresponds to a stocihiometric vapor-air mixture. Compare your result with thevalue quoted for the firepoint of n-decane in Table 6.1

$C_{10}H_{22}$ $M1 := 12 \cdot 10 + 22$ $M1 = 142$ $hfg := 0.28 \cdot 1000 \ \frac{kJ}{kg}$

$Tb := 447$ $Pkpa := 101000$ $xl := 0.006$ $Rgas := 8.314$

C10H22 + a(O2+3.76N2) -> 10CO2 + 11H2O + 3.76aN2 $a := \frac{31}{2}$

$x_{st} := \frac{1}{1 + a \cdot 4.76}$ $x_{st} = 0.013$

$Tl := \left(\frac{1}{Tb} - \frac{Rgas \cdot \ln(xl)}{hfg \cdot M1} \right)^{-1}$ $Tl = 302.397$ T flash point is found using the lower limit flammability

For the stoichiometric case we get

$T_{st} := \left(\frac{1}{Tb} - \frac{Rgas \cdot \ln(x_{st})}{hfg \cdot M1} \right)^{-1}$ $T_{st} = 318.539$ is the temperature associated with a stocihiometric mixture in the gas phase.