

AME 598t
Prof. J. M. Powers
Homework 7
Due: Thursday, 24 March 2005

1. Consider a mixture of CH_4 and O_2 . Initially, the mixture is at 298.15 K and 100 kPa . The mixture is in a fixed, closed, adiabatic vessel with $V = 1\text{ m}^3$. Assuming the only possible products of combustion are CO_2 , H_2O , O_2 and CH_4 , give a plot of adiabatic flame temperature as a function of equivalence ratio.
2. Consider the problem discussed in detail in lecture in which $A \rightleftharpoons B$, and for which A and B have identical molecular masses and identical specific heats, and in which the system undergoes a one-step reversible reaction. Using almost all of the same parameters and same model, study how the system behaves as E_f is varied. Give a plot of the equilibrium value of λ as a function of E_f . Give a plot of the induction time as a function of E_f . Use both the asymptotic and full numerical integration to determine the induction time.