AME 60636
Homework 2
Due: Wednesday, 26 January 2022, 12:05 PM, on Sakai

Consider a problem of hydrogen dissociation and recombination:

$$\mathrm{H_2 + M \rightleftharpoons H + H + M.}$$

1. Consider the appropriate parameters for the reaction as found in the 2005 *AIAA Journal* paper found in the documents section of the course home page. Take $T = 6000$ K. Find thermodynamic properties from any standard thermodynamics textbook. Write a code in `Fortran` and `Mathematica` to calculate the concentrations as a function of time if initial concentrations are $\widehat{\overline{\rho}}_{\mathrm{H_2}} = 10^{-6}$ mol/cm^3, $\widehat{\overline{\rho}}_{\mathrm{H}} = 10^{-6}$ mol/cm^3. Give plots of concentration versus time and pressure versus time.

2. For the same initial conditions, generate a plot of how the equilibrium concentrations of H and $\mathrm{H_2}$ vary with temperature.

3. Give a plot of how the time scales found by linearization near equilibrium behave as temperature is varied over a wide range.