Matlab Tutorial Practice EECE503 February, 2009
Prof. M. Dudukovic

Use the Matlab techniques we just introduced to solve these reaction engineering problems:

1. For a liquid phase reaction A→R, the rate of reaction is as follows:

C_A, mol/L	$-r_A$, mol/L min
0.3	0.5
0.4	0.6
0.5	0.5
0.6	0.25
0.7	0.10
0.8	0.06
1.0	0.05
1.3	0.045

How long does it take for reactant A in a batch reactor to drop from 1.3mol/L to 0.3mol/L? Use Matlab numerical integration.

(For a batch reactor, $t = \int_{C_A}^{C_{A0}} \frac{dC_A}{-r_A}$)

2. Reaction

$$A + B \xrightarrow{k1} R$$

$$R + B \xrightarrow{k2} S$$

~~For a~~ batch reactor the mass balances for the components are given by

$$\frac{d[A]}{dt} = -k1 \cdot [A] \cdot [B]$$

$$\frac{d[B]}{dt} = -k1 \cdot [A] \cdot [B] - k2 \cdot [R] \cdot [B]$$

$$\frac{d[R]}{dt} = k1 \cdot [A] \cdot [B] - k2 \cdot [R] \cdot [B]$$

$$\frac{d[S]}{dt} = k2 \cdot [R] \cdot [B]$$

Given $k_1=k_2=1$ m^3/mol s
At t=0, $[A]_0=1$ mol/m^3, $[B]_0=2$ mol/m^3, $[R]_0=[S]_0=0$ mol/m^3.
Solve for the concentration profiles of each component as function of time.
What are the concentrations in the reactor at t=10secs?