ChE 272 Introduction to Chemical Engineering Calculations University of Rhode Island
Professor Greenfield Spring 2007

Homework 4
due February 22, 2007

For problems 1–5, the idea is to do the calculation by hand, so you can understand how it works. Feel free to **check** your answer by using a computer program. To get full credit you will have to **solve it by hand**, though. Feel free to use the "checksum" idea for catching hand calculation errors. For problem 6, set up the problem by hand, and then solve the equations on the computer. (The "setting up" is the important new part of this last question.)

1. Chapra and Canale, problem 9.1
2. Chapra and Canale, problem 9.2, sections (a), (b), and (c).
3. Use the matrices defined on Chapra and Canale, problem 9.2, to perform these operations. Do all these by hand, not with matlab or another program.

   [E] + [B]

   [A] + [F]

   2 $\times$ [C]

   [F] $\times$ [C]

   [F] $\times$ [F]^T

   [F]^T $\times$ [F]
4. Chapra and Canale, problem 9.7.
5. Chapra and Canale, problem 9.9. Solve first by hand (and check your answer); then solve by using Matlab.
6. Chapra and Canale, problem 12.4. Recall from CHE 212 that the concentration of a compound that leaves a reactor equals the concentration inside it. Assume that each unit operates at steady state (i.e. in = out). Note too that this problem is a set of *linear* equations because all flow rates are known. (Often that won't be the case!)

Late homework 4 papers will be penalized using the function from homework 3:

$$(1-p) = \frac{1}{kc_0 t + 1}$$

This function is the solution to a second-order chemical rate equation,

$$-\frac{dc}{dt} = kc^2$$

where c is the concentration, k is the rate constant, and the extent of reaction p is defined as $c = c_0(1-p)$. p begins at zero and goes to 1 as the reaction completes. The term kc_0 = 0.07/day. Here, the left side $(1-p)$ corresponds to the number of possible points that can be earned, and t refers to the number of days that the homework is late.