I. Complete the pre-course survey on-line (see link from course web page)

II. Math Fun!

1. Fractions and numbers
   a. $\sqrt{-4} = ?$
   b. $\frac{2}{3} + \frac{7}{6} = ?$
   c. Make a single fraction: $\frac{5}{4} / \frac{8}{9}$
   d. Clear the denominator of imaginary numbers: $\frac{3}{s+2+i}$
2. Factors and distribution:
   a. Distribute: $2(\frac{3}{8}x - 5)$
   b. Factor the following:
      i. $x^2 - 5x + 4$
      ii. $y^2 - 36$
      iii. $u^2 + 3u + 1$ Hint: complete the square
      iv. $s^2 + s + 3$ Hint: some factors may not be real
3. Integrals and Differentials:
   a. Calculate: $\frac{d}{dy}\left[(y^2 + 2y)^3\right]$
   b. Calculate: $\frac{d}{dx}\left[\frac{x^2 + 2}{x}\right]$
   c. Solve for T(x) (integrate): $2\frac{dT}{dx} + T = 1$
4. Miscellaneous:
   a. Manipulate the right hand side to show that the following are equal:

$$\frac{5s+8}{(s+1)(s+2)(s+4)} = \frac{1}{s+1} + \frac{1}{s+2} - \frac{2}{s+4}$$

   b. Solve for y_1 and y_2 if u_1=3 and u_2=4:

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$

   c. Calculate: $\lim_{s \to \infty} \frac{2s^2 - 2s + 1}{3s^2 + s - 2}$

III. Bequette: Chap. 1 #9

IV. Bequette: Work through Module 1: Intro. to Matlab. Do Additional Exercises #1, 4 & 5. For #4, create an m-file function which will return the two requested objects when given a vector. Submit your m-file with the exercise answers.

V: Computer Programming Fun!

For each program, submit (1) a paper listing of the program and a demonstration of the working program and (2) an electronic copy of the m-files as attachments in a single e-mail message to Mike Keung at *mkeung@jhu.edu* (use subject line "ChemBE 409 HW1").

1. Write a Matlab (or Octave) m-file function to calculate the Reynolds number for flow in a pipe given the pipe diameter, the volumetric flow rate, and the fluid's viscosity and density. Your function can assume or require particular units—note these requirements in comment lines.

2. Write a Matlab (or Octave) m-file function which will return the friction factor for flow in a pipe, given the Reynolds number. Your function should work for any value of the Reynolds number.

3. Plot the friction factor versus Reynolds number using your function for a demonstratively-wide range of the Reynolds number.