

King Fahd University of Petroleum & Minerals
Chemical Engineering Department
CHE 560 –Numerical Methods in Chemical Engineering
2010 - 2011 (102)

HW#1

Due: Tue. 1-March-2011

Problem 1. (10 points)

The following dimensionless temperature relation was derived for the temperature distribution for fluid cooling in a pipe with plug flow velocity profile:

$$\frac{T - T_w}{T_0 - T_w} = e^{-\lambda z}$$

Plot the dimensionless temperature as a function of z (take values of z between 0 and 100 m) for $\lambda = 0.1, 0.5, 1$ and 10. What do you learn from the plot?

Problem 2. (30 points) Solve problem 1.9 from your textbook.

Problem 3. (50 points)

For the following systems of equations:

$$\begin{bmatrix} 1 & -1 & 2 & 1 \\ 3 & 2 & 1 & 4 \\ 5 & 8 & 6 & 3 \\ 4 & 2 & 5 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ -1 \end{bmatrix}$$

- a) Solve (without using a computer) the above systems of equations using Gaussian elimination. **(15 points)**
- b) Solve (without using a computer) the above systems of equations using LU-decomposition. **(20 points)**
- c) Use the sample Fortran program provided to you in WebCT (Code_1.f and Code_1_in.txt) to solve the above equations. Send your program by e-mail through WebCT as yourname-hw1.f **(15 points)**