BIL108E **Introduction to Scientific and Engineering Computing** Autumn - 2011

Lab 8

1. An experiment has produced the following data:

t	0	0.5	1.0	6.0	7.0	9.0
y	0	1.6	2.0	2.0	1.5	0

   We wish to interpolate the data with a smooth curve in the hope of obtaining reasonable values of y for values of t between the points at which measurements were taken. Plot experimental data overlay with the interpolated values. What is y at t = 4.

2. Determine the 4th degree polynomial y(x) that passes through the points (0,−1), (1, 1), (3, 3), (5, 2) and (6,−2).

3. The data points in the table lie on the plot of f (x) = 4.8 cos (πx/20). Interpolate this data at x = 0, 0.5, 1.0, . . . , 8.0 by the lowest degree polynomial and compare the results with the "exact" values given by *y = f (x).*

x	0.15	2.30	3.15	4.85	6.25	7.95
y	4.79867	4.49013	4.2243	3.47313	2.66674	1.51909

4. The table shows the drag coefficient c_D of a sphere as a function of Reynolds number Re. Find c_D at Re = 5, 50, 500 and 5000.
   Hint: use log–log scale.

Re	0.2	2	20	200	2000	20000
c_D	103	13.9	2.72	0.800	0.401	0.433

5. The kinematic viscosity μ_k of water varies with temperature T in the following manner:

T (◦C)	0	21.1	37.8	54.4	71.1	87.8	100
μ_k (10^{-3} m^2/s)	1.79	1.13	0.696	0.519	0.338	0.321	0.296

   Interpolate μ_k at T = 10 ◦ , 30 ◦ , 60 ◦ and 90 ◦ C