

**King Fahd University for Petroleum & Minerals**  
**Department of Civil and Environmental Engineering**  
**2015-2016 [151]**  
**CE 318 - 1**  
**Numerical and Statistical Methods in Civil Engineering**  
**Assignment NO 2**

**Subjects: Interpolations and Curve Fitting**

**DUE DATE: Sept. 29, '15**

1. Use *quadratic* interpolation to estimate logarithm of 7.5 to base 10 [i.e.:  $\log_{10} 7.5$ ], then
  - (a) interpolate between  $\log 7$  and  $\log 8$ ;
  - (b) interpolate between  $\log 7.2$  and  $\log 7.8$ ;
  - (c) compute per cent relative error  $\varepsilon_t$  for the results in (a) and (b) relative to the true value.
  - (d) plot (using *Excel*) and compare the *interpolating*-function versus the exact *log*-function within the range from 5 to 8.
  - (e) Comment on the suitability of the interpolating function.
2. Solve items *a*, *b*, and *c* of problem 18.12 (textbook page 522) and compare the per cent relative errors.
3. Solve problem 18.13 (textbook page 522).
4. Develop the *cubic spline* for the following given three data points:

$x$	1.	2.5	4.0
$f(x)$	-2.5	5.5	7.5

Then use the derived *spline* to: (a) predict  $f(2.5)$ ; (b) verify the value of  $f(3)$ .

5. Use *least-squares regression* to fit a straight line to the following data:

$x$	1	2	4	6	3	5	7	9
$y$	-1	3.5	5.7	2.1	8.1	3.2	5.5	-5

Then use the *linear fit* to:

- (a) determine slope and intercept;
- (b) determine the standard error; and
- (c) compare the *linear-fit* to the plot of data.