1 Hands-on–Interpolation and Curve Fitting with MATLAB II

1. For the given data points;

x	y
2	2.12
4	2.24
6	2.68
10	3.56

   i construct the divided-difference table by *hand*

   ii run the MATLAB code (newpoly.m) and compare with your table.

   - interpolate for $x = 8$
   - extrapolate for $x = 11$

   iii run the MATLAB code (divDiffTable.m)

   - interpolate for $x = 8$
   - extrapolate for $x = 11$

   Hint: Open these m-files with the editor. Then execute the codes according to the first line. Use these outputs to inter/extrapolate (see lecture notes).

2. The MATLAB procedure for polynomial least-squares is *polyfit*. Study the following example;

```
>> x =(0:0.1:5)'          % x from 0 to 5 in steps of 0.1
>> y = sin(x)             % get y values
>> p = polyfit(x,y,3)     % fit a cubic to the data
p =     0.0919   -0.8728    1.8936   -0.1880
>> f = polyval(p,x)       % evaluate the cubic on the x data
>> plot(x,y,'o',x,f,'-') % plot y and its approximation f
```

3. For the given data points;

T ($^{\circ}C$)	R (ohms)
20.5	765
32.7	826
51.0	873
73.2	942
95.7	1032

i Plot it (such as plot(x,Y,'o')).

ii The graph suggest a linear relationship.

$$y = ax + b$$

values for the parameters, a and b, can be obtained from the plot.

iii Write a MATLAB code that calculates each summation;

$$\begin{array}{ccc} \sum x_i^2 & \sum x_i & \sum x_i Y_i \\ \sum x_i & N & \sum Y_i \end{array}$$

All the summations are from $i = 1$ to $i = N$.

iv Then it is obtained as

$$\begin{aligned} a\sum x_i^2 + b\sum x_i &= \sum x_i Y_i \\ a\sum x_i + bN &= \sum Y_i \end{aligned}$$

Solving these equations simultaneously gives the values for slope and intercept a and b. Now, we have a function in the form;

$$y = ax + b$$

v Plot them (such as plot(x,y,x,Y,'o')).