1 Interpolation and Curve Fitting

1. 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
f = polyval(p,x);  % evaluate the cubic on the x data
plot(x,y,'o',x,f,'-')  % plot y and its approximation f
```

2. For the given data points;

x	Y
0.000	1.500
0.142	1.495
0.285	1.040
0.428	0.821
0.571	1.003
0.714	0.821
0.857	0.442
1.000	0.552

- to which we will fit $y(x) = \alpha e^{\beta x}$
  Hint: First, we should compute a new table with $z(x) = lny(x)$

x	z
0.000	
0.142	
0.285	
0.428	
0.571	
0.714	
0.857	
1.000	

- Construct the normal equations
  Hints: $A = ln\alpha$ and $C = \beta$
- Solve these normal equations to find A and C
- Convert back to the original variables
- Plot Y vs x and y vs x then compare them.

- **Soln:** $y(x) = 1.561e^{-1.132x}$

3. Apply the procedure given in the first item by using the data set in the previous item.

   - **Hints:**
     - fit a cubic to the data
     - evaluate the cubic on the x data
   - Plot by $plot(x, Y, 'o', x, f, '-')$
   - Compare this least-square polynomial with the function used in the previous item.