(Part II) Lab-session 5

1) Consider the following ordered pairs of data:

x-values:	2	4	8	11	16	19	21	27	29	31
y-values:	6	13	24	33	48	53	60	77	83	87

Show that these data are linearly correlated, that is the best fit function follows

$$y = \alpha x + \beta \ . \tag{1}$$

a) Use the SLOPE and INTERCEPT functions to determine the coefficients α and β.

b) Use the LINEST array function to determine the coefficients α, β and the square of the regression coefficient.

c) Produce an XY chart with trendline to determine the same quantities.

d) Compute the residues $z_i = \alpha x_i + \beta - y_i$. Plot the z_i-values against the x_i-values. Are the values randomly distributed? Does this plot confirm that the data are linearly correlated?

2) For the following ordered pairs of data

x-values:	2	4	8	11	16	19	21	27	29	31
y-values:	6	18	60	109	235	340	421	738	840	1000

produce an XY chart with trendline. Show that these data are correlated via a cubic equation, that is the best fit function follows

$$y = \alpha x^3 + \beta x^2 + \gamma x + \delta \ . \tag{2}$$

Determine the coefficients α, β, γ, δ.

3) Write a user defined array function called "MyRegression" which carries out the same computation as SLOPE, INTERCEPT and part of the LINEST array function. The input values are a set of ordered pairs of data. The function returns the coefficients α,β of equation (1) and the square of the regression coefficient. Test your function with the data of task 1.

You can follow this outline for the program:

Function MyRegression(xdata, ydata)

.....declare here some variables...

Dim tt(5) *(an array is declared this way)*

(*write here a do loop which computes the mean values according to*

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$$

(*write here a do loop which uses the mean values and computes*

$$hxy = \sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y}) \qquad hx = \sum_{i=1}^{n}(x_i - \bar{x})^2 \qquad hy = \sum_{i=1}^{n}(y_i - \bar{y})^2$$

Compute here:

the slope: slope = hxy/hx,

the intercept: intercept =$\bar{y}$ − slope$\bar{x}$

the square of the regression coefficient: corr = $hxy^2/(hxhy)$

Prepare the output as:

tt(0) = "Slope:"

tt(1) = Slope

tt(2) = "Intercept:"

tt(3) = Intercept

tt(4) = "Correl:"

tt(5) = Corr

MyRegression = tt

End Function