Engin 103 February 24, 2011 back to e-syllabus	Topics: CW4 Logbook questions

CW4

(a) Save CW3 into a new file, then in Sheet #1 modify it to produce a linear and a cubic model for the same data set, insert snapshots of these worksheets into **Table 1** in a MS Word file. Make a table like the one below for the "s" values for the linear, quadratic, and cubic models, along with the coefficients obtained for each model. Indicate which is the best model (linear, quadratic, or cubic) for our set of data, and explain why.

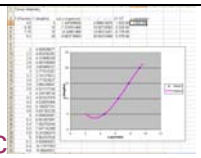
Model	Coefficients	S parameter
Linear 	A= B= C= D=	
Quadratic 	A= B= C= D=	
Cubic 	A= B= C= D=	

Table 1: All terms in polynomial models using same data set as in CW3

(b) Download this data set, repeat the table above for this new data set: (i) In Sheet#2 using all terms in each polynomial model. Insert spreadsheet snapshots, polynomial coefficients, and parameter s into **Table 2** in your MS Word file (ii) In Sheet #3 using only the highest order term in each polynomial model. Insert spreadsheet snapshots, polynomial coefficients, and parameter s into **Table 3** in your MS Word file. Can you conclude what is the dominant relationship (linear, quadratic, or cubic) between the periods and the lengths of a pendulum?

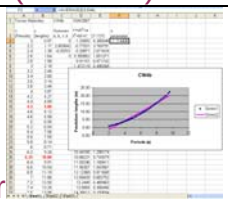
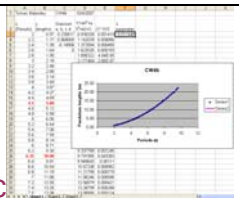
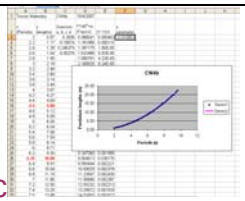
Model (all terms)	Coefficients	S parameter
Linear 	A= B= C= D=	
Quadratic 	A= B= C= D=	
Cubic 	A= B= C= D=	

Table 2: All terms in polynomials models using new data set

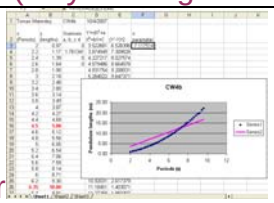
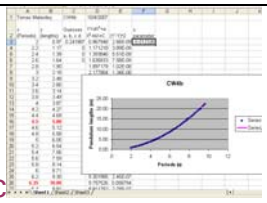
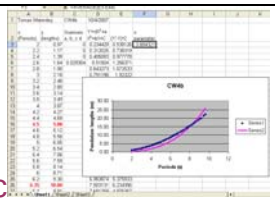
Model (only leading terms)	Coefficients	S parameter
Linear 	A= B= C= D=	
Quadratic 	A= B= C= D=	
Cubic 	A= B= C= D=	

Table 3: Only highest order term in polynomial models using new data set

In each team, students working together at a computer numbered between 1 and 10 will submit file cw4_XX_a.xlsx (containing the spreadsheets) and cw4_XX_a.docx (containing the Tables), students working at a computer numbered between 11 and 20 will submit file cw4_XX_b.xlsx (containing the spreadsheets) and cw4_XX_b.docx (containing the Tables), to the *files* folder in the server. Replace XX by 01 if team 1, etc. Include your names within the files.

Q&A

1) What is the purpose of CW4?

The purpose is to modify the Excel Spreadsheet we created for CW3 to obtain a cubic and linear model for the same data set. After assembling a table with the s parameters and coefficients for the three models, we will be able to select the best model for a given data set. This is something you need to do for part II of Project 1.

2) How many coefficients are there in these different models?

Cubic polynomial:

$Y'=f(X)= D*X^3 + A*X^2 + B*X + C$ (has 4 coefficients: D, A, B, C)

Quadratic polynomial:

$Y'=f(X)= A*X^2 + B*X + C$ (has 3 coefficients: A, B, C or 4 being D=0)

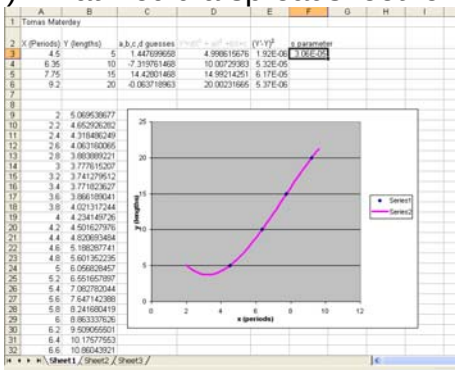
Linear polynomial:

$Y'=f(X)= B*X + C$ (has 2 coefficients: B, C or 4 being D=A=0)

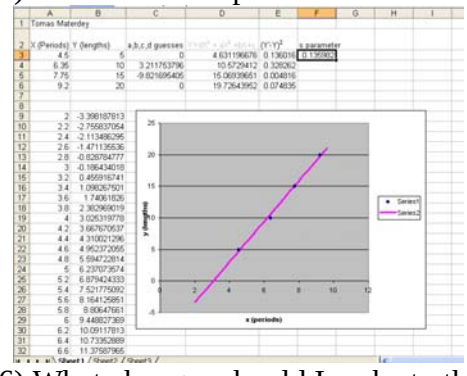
3) How can I get a snapshot of the worksheet?

Copy a snapshot of the Excel screen by doing ALT+PRINT SCREEN, then PASTE into a WORD file

4) What would a spreadsheet for a cubic model look like?

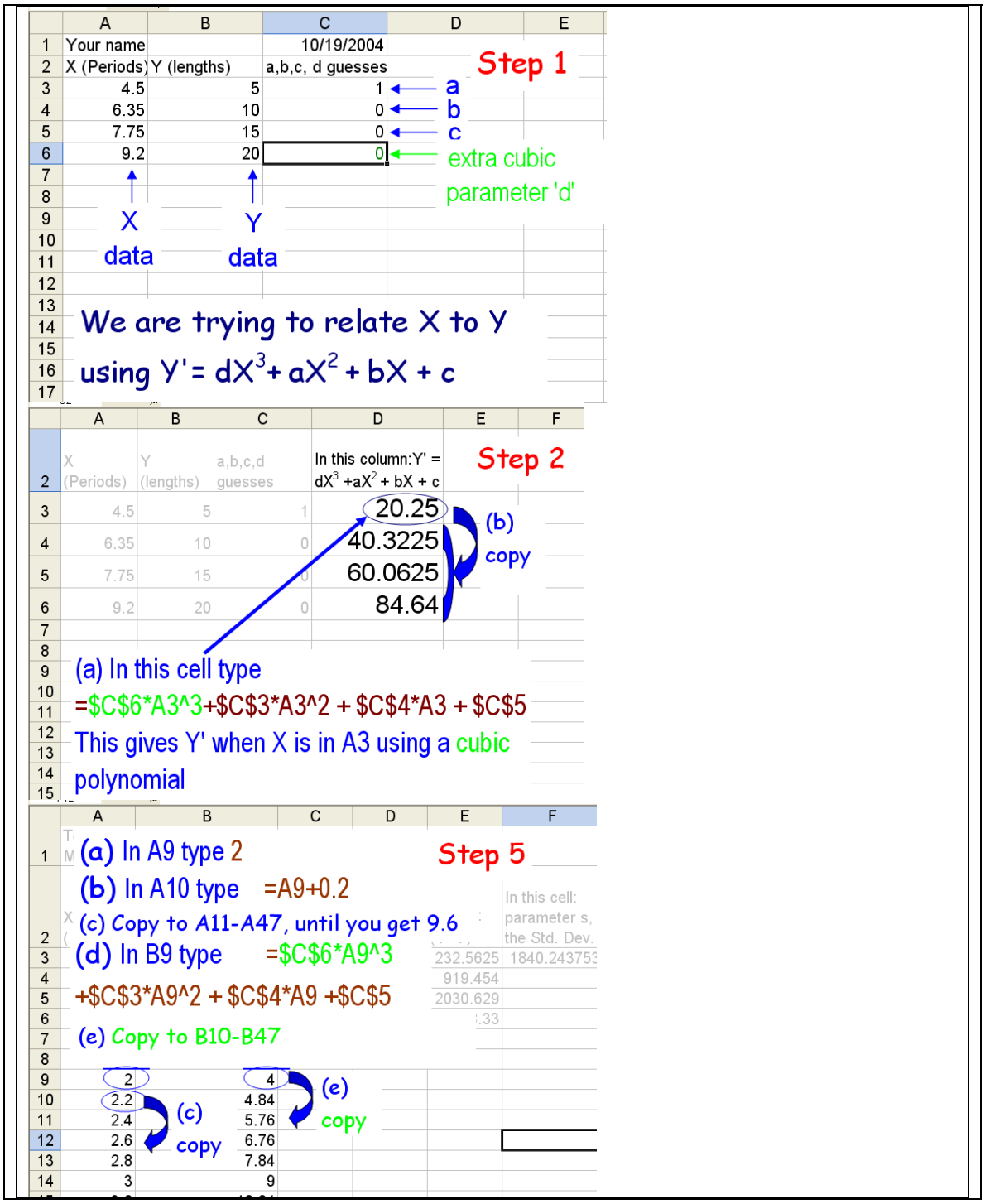


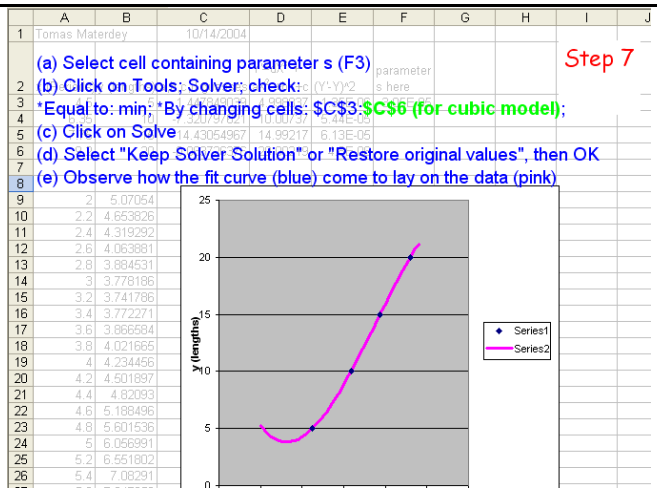
5) What would a spreadsheet for a linear model look like?



6) What changes should I make to the CW3 spreadsheet to produce a cubic model?

Here are the changes (in green) to make to the spreadsheet for CW3 to obtain a cubic model in CW4a)


Step 1
a
b
c
extra cubic parameter 'd'
X data
Y data
We are trying to relate X to Y
using Y' = dX3 + aX2 + bX + c
Step 2
In this column:Y' = dX3 +aX2 + bX + c
20.25
40.3225
60.0625
84.64
(b) copy
(a) In this cell type
=$C$6*A3^3+$C$3*A3^2 + $C$4*A3 + $C$5
This gives Y' when X is in A3 using a cubic polynomial
Step 5
(a) In A9 type 2
(b) In A10 type =A9+0.2
(c) Copy to A11-A47, until you get 9.6
(d) In B9 type =$C$6*A9^3 +$C$3*A9^2 + $C$4*A9 +$C$5
(e) Copy to B10-B47
(c) copy
(e) copy



6) How to get a QUADRATIC model using the spreadsheet made for a CUBIC model?

7) How to get a LINEAR model using the spreadsheet made for a CUBIC model?

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LOGBOOK: example of a logbook page

-Use a quadrille notebook; number all pages; date all entries
-Write your notes for all activities, thoughts, problems and solutions, and learning conclusions related to Engin 103. You should write down progress, outcomes, and conclusions on projects and teamwork; conclusions from class work (including LabVIEW) and homework.
-In addition you should answer in the logbook all questions listed in these notes in blue, as shown below:

17) Explain in your own words what did you do in each of the seven steps to do data modeling with Excel in CW3. Write Y'=f(X), being f the quadratic polynomial obtained after using Solver with values for the coefficients a,b,c substituted in. Also write down the final s parameter achieved with these coefficients. Attach a copy of your spreadsheet for CW3.

18) You have the spreadsheet to make a quadratic model for certain data set, such as the one used in CW3.
(a) Explain what changes you would do on the spreadsheet to make a linear model for the same data set. Use the most economical way that would not require changing the equations in cells D3 and B9 and copying them into the cells below.
(b) Explain what changes you would do on the spreadsheet to make a cubic model for the same data set.

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