Engin 103 February 23, 2010 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=	
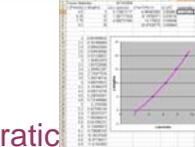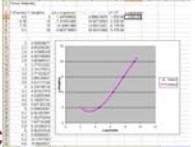
Table 1: All terms in polynomial models using same data set as in CW3

(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?

(c)

Model (all terms)	Coefficients	S parameter
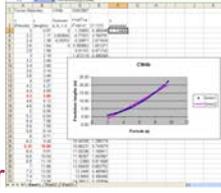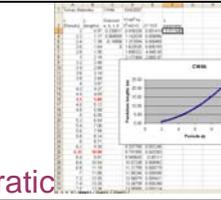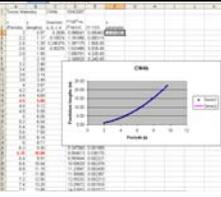
Linear	A= B= C= D=	
Quadratic	A= B= C= D=	
Cubic	A= B= C= D=	
Table 2: All terms in polynomials models using new data set		

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		
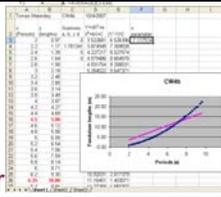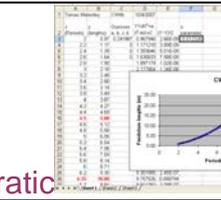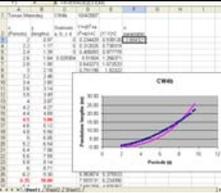
In each team, students working together at a computer numbered between 1 and 10 will submit file cw4_XX_a.html and folder cw4_XX_a_files, students working at a computer numbered between 11 and 20 will submit file cw4_XX_b.html and folder cw4_XX_b_files, to the *files* folder in the server. Replace XX 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 apply a cubic and linear model to the same set of data. After assembling a table with the s parameters and coefficients for the three models, we will be able to determine the best model for a given set of data. This is something you should 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)

Linear polynomial:
$Y'=f(X)= B*X + C$ (has 2 coefficients: B, C)

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 a spreadsheet for a cubic model would look like?
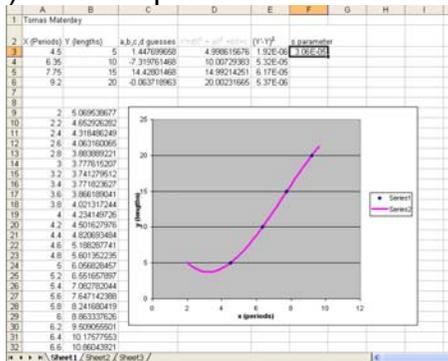
5) What a spreadsheet for a linear model would look like?
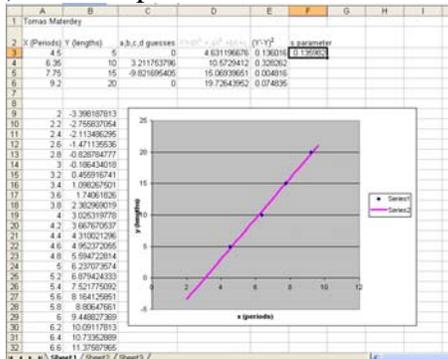
6) What changes should I make to the CW3 spreadsheet to produce a cubic model?

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

Step 1

	A	B	C	D	E
1	Your name		10/19/2004		
2	X (Periods)	Y (lengths)	a,b,c, d guesses		
3	4.5	5	1	← a	
4	6.35	10	0	← b	
5	7.75	15	0	← c	
6	9.2	20	0	← extra cubic parameter 'd'	

X data   Y data

We are trying to relate X to Y

using $Y' = dX^3 + aX^2 + bX + c$

Step 2

	A	B	C	D
2	X (Periods)	Y (lengths)	a,b,c,d guesses	In this column: $Y' = dX^3 + aX^2 + bX + c$
3	4.5	5	1	20.25
4	6.35	10	0	40.3225
5	7.75	15	0	60.0625
6	9.2	20	0	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

In this cell: parameter s, the Std. Dev.

	A	B	C	D	E	F
3					232.5625	1840.243753
4					919.454	
5					2030.629	
6					.33	
9	2	4	(e) copy			
10	2.2	4.84				
11	2.4	5.76	(c) copy			
12	2.6	6.76				
13	2.8	7.84				
14	3	9				

The spreadsheet shows:

Tomas Materdey   10/14/2004

(a) Select cell containing parameter s (F3)
(b) Click on Tools; Solver; check:
*Equal to: min; *By changing cells: $C$3:$C$6 (for cubic model);
(c) Click on Solve
(d) Select "Keep Solver Solution" or "Restore original values", then OK
(e) Observe how the fit curve (blue) come to lay on the data (pink)

Step 7
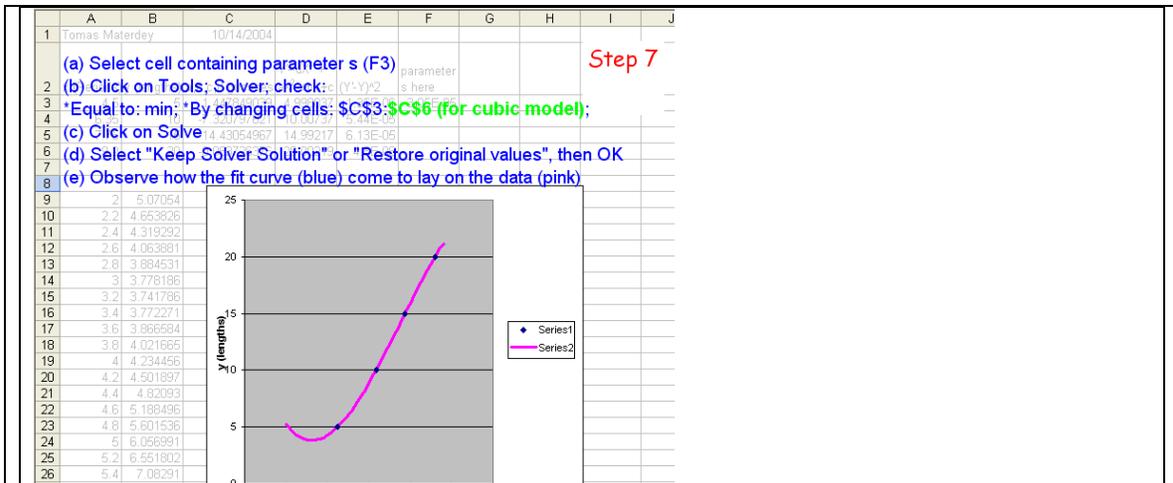
6) **How to get a QUADRATIC model using the spreadsheet made for a CUBIC model?**

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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