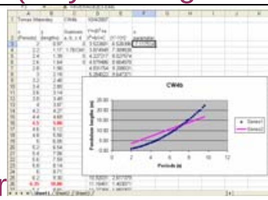
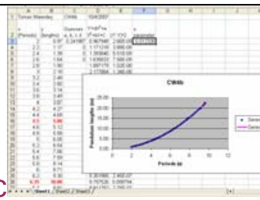
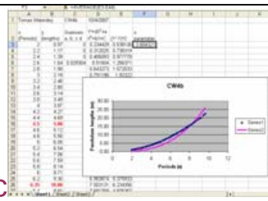
Engin 103 February 28, 2008 back to e-syllabus	Topics: CW4 (Cont.) Project 1 Progress Reports Logbook questions

CW4 (Part b ii)

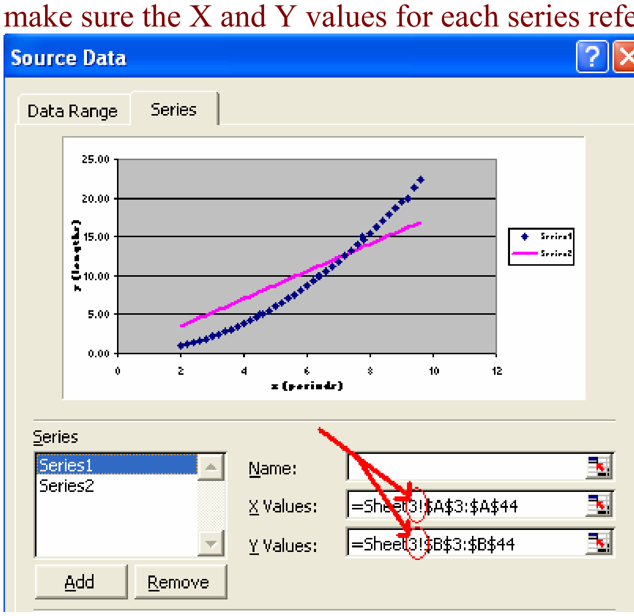
b) (ii) In Sheet #3 using only the highest order term in each model

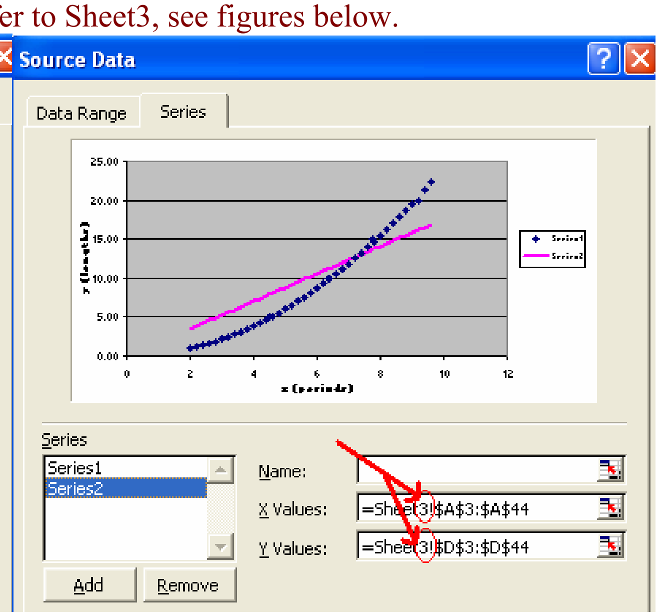
Model (only leading terms)	Coefficients	S parameter
Linear 	A= B= C= D=	
Quadratic 	A= B= C= D=	
Cubic 	A= B= C= D=	

Q&A

1) After copying Sheet#2 to Sheet#3, do I need to check the two series in the graph?

Yes, nn Sheet#3, right click inside the graph, select “Source Data” click on “Series”, and make sure the X and Y values for each series refer to Sheet3, see figures below.



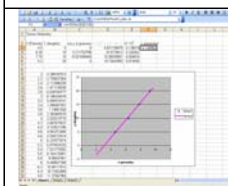
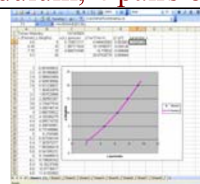
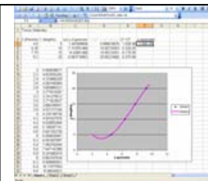
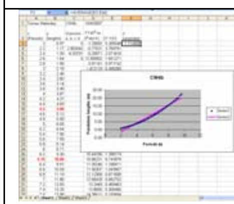
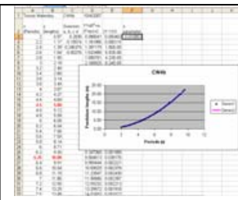
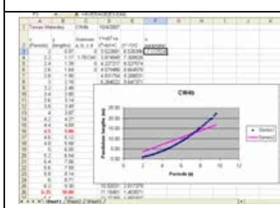
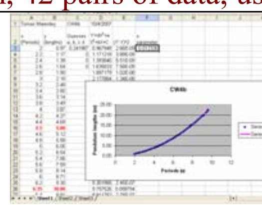
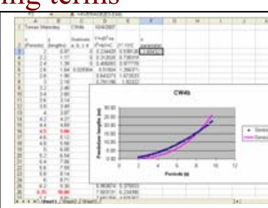


2) How do I get the different models with only the leading terms without changing the formula in cell D3?

If you already have a cubic formula in D3-D44, you can get the cubic, quadratic, and linear models using only the leading terms by allowing Solver to change \$C\$6, \$C\$3, or \$C\$4, respectively. Notice that at the same time, in Sheet#3, to obtain the cubic model cells C3 through C5 should contain a zero, for the quadratic model, cell C4 through C6 should contain a 0, and for the linear model, cells C3, C5, and C6 should contain a 0.

3) So what is the best model if we use only the leading term?

The summary of CW4 results is shown in the table below.

Linear	Quadratic	Cubic
Pendulum, 4 pairs of data, used all terms		
		 Best
Pendulum, 42 pairs of data, used all terms		
		 Best s=0.010853
Pendulum, 42 pairs of data, used only leading terms		
	 Best s=0.012326	

When only the leading term was used, the quadratic model showed the lowest s parameter. This means our data behave more in line with a quadratic term rather than a cubic or a linear term. In deed, based on Newton's Laws and the Universal Law of Gravitation, the period of an ideal pendulum (mass of string is negligible, bob is not so large, and friction is ignored) is given by

$$T = 2\pi\sqrt{\frac{L}{g}} \qquad \text{or} \qquad L = \frac{gT^2}{4\pi^2}$$

where T is the period, L is the length, and g is the acceleration of gravity.

From the value of the coefficient A, you can derive the constant acceleration of gravity g. In fact a method to measure this constant at different latitudes and longitudes is to measure the periods of a pendulum of different lengths, then extract g from the coefficient of the

quadratic term.

4) While doing data modeling, can we distinguish between an engineer and a scientist approach?
Engineers tend to make a more precise model of a system (getting lower s parameter) by including additional terms. Scientists tend to idealize a system in quest of a universal model that is simpler, but also less accurate when applied to a real system. Precision and universality satisfy a complementary relation similar to that of the uncertainty principle in quantum mechanics.

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Project 1 Progress Report:

Project 1 leaders: please copy this document and fill in your team response below. Then save as a web page: name "p1pr.html" and upload to your *files* folder.

Team #	a)Describe what system your team is building b) What are the input and output	c) In what units will your team be measuring the input and output, d) what instruments are you using to make the measurements (rulers, stop watch, etc.) e) list the distinctive values you can get for the input in increasing order	Assign a grade on communication in your team in this project: 4 –members always communicate how they are doing on their part 3 – members sometimes communicate how they are doing on their part 2- some member does not reply emails or phone calls 1 – members show no interest in participating
1			
2			
3			
4			
5	Our team will either build a roller coaster. The input for the rollercoaster would be the height and angle of the ramp and the output would be the speed of the object.	c)Input-height-CM Output-speed-seconds d)Ruler, stop watch, and protractor e)to be determined **Question e) is important, it may affects your design. Your system should allow at least 10 distinctive pairs of data.**	Grade 4
6	a) Our team is building a trebuchet. b) Our input is the angle (height) our output is the distance.	c) We will be using measures of distance. (Inches, etc.) d) We will be using a ruler. e) The distinctive value that you can get is an angle of 40 degrees to 130 degrees on the arm of the trebuchet. **This is a good progress report**	4-Our team members always communicate how they are doing on their portion of the project

7			
8			
9			
10			

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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) Attach snapshots of your Sheet#1-3 and the three tables shown in CW4 with values of the polynomial coefficients and s parameters in the logbook. Explain what is different in the graphs of the three tables in CW4.
18) Calculate the constant acceleration of gravity g (in m/s^2) using the coefficient A from your table #3 of CW4 using the formula provided above; show the calculations and the final result in your logbook
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