Polynomial Curve Fitting with Excel

EAS 199A Fall 2011

Overview

Practical motivation: fitting a pump curve

- · Get data from the manufacturer.
- Use Excel's TRENDLINE function to fit polynomials to the data.
- Extract the polynomial coefficients for later use.

Note: This example uses pump data from a manufacturer. For the pump project assignment, use the measured data for your pump.

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Sample pump data

A circulating pump from the Grainger Catalog

- http://www.grainger.com
- Select "pump" under Product Category
- Select "Centrifugal" under "Narrow your search by" (or click on the Centrifugal Pump panel in the center of the page)
- Select "Self priming pressure pumps"
- * As an example, pick the first pump: Goulds GT10

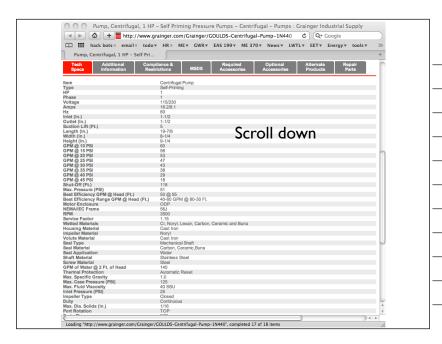


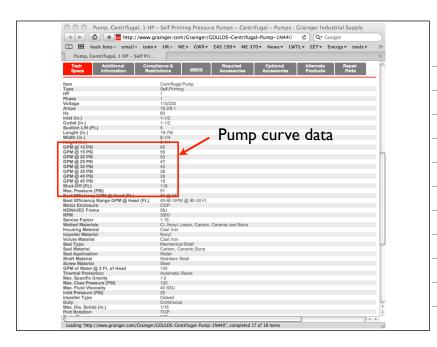
Direct link (24 November 2010) http://www.grainger.com/Grainger/GOULDS-Centrifugal-Pump-IN440

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Polynomial Curve Fit with Excel

- I. Store the data
- 2. Make a scatter plot
- 3. Right-click on data, and "add a trendline"
 - (a) Select Polynomial, dial-in the desired order
 - (b) Check boxes to display equations and R2
 - (c) Select "Options" in the list on the left, click the "Custom" radio button, and add "Cubit fit" in the text box for the custom label
 - (d) Close dialog box
- 4. Right-click on the legend and select "format trendline label"
 - (a) Select "Number" in the list on the left and "Scientific" and the Category for the number format
 - (b) Change data to scientific notation with 3 or 4 decimal places
 - (c) Select "Font" in the list on the left, and increase the font size to make the text legible

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Manually extracting the curve fit coefficients

- 1. Suppose the data is in columns A and B, rows 7 through 15
- 2. Suppose you want a cubic fit
- 3. Enter these formulas in empty cells

=Index(LINEST(B7:B15,A7:A15^{1,2,3}),1,1) =Index(LINEST(B7:B15,A7:A15^{1,2,3}),1,2) =Index(LINEST(B7:B15,A7:A15^{1,2,3}),1,3) =Index(LINEST(B7:B15,A7:A15^{1,2,3}),1,4)	
=Index(LINEST(B7:B15,A7:A15^{1,2,3}),1,3) =Index(LINEST(B7:B15,A7:A15^{1,2,3}),1,4)	
	=Index(LINEST(B7:B15,A7:A15^{1,2,3}),1,3)
	=Index(LINEST(B7:B15,A7:A15^{1,2,3},1,0),1,3

The first four lines give the coefficients of the cubit polynomial. The last line gives the value of R^2

1	Pump curv	e for Goulds GT
2		Grainger Catalo
3		http://www.grain
4		
5		
6	Q (GPM)	h (psi)
7	60	10
8	56	15
9	53	20
10	47	25
11	43	30
12	38	35
13	29	40
14	18	45
15	0	51

R2 9.9822E-01

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Pump curve for Goulds GT10 Grainger Catalog, Part Number 1N440 (Catalog 401, November 2010) http://www.grainger.com/Grainger/GOULDS-Centrifugal-Pump-1N440 y = -1.1495E-04x³ + 1.9462E-04x² - 2.8397E-01x + 5.0946E+01 R² = 9.9822E-01

Finished spreadsheet