	A	B	C	D	E	F	G	H	I	J

2 EGR 120

3 Introduction to Engineering

4 File: Exponential Regression - statistics.xls

5

6 <u>Exponential Regression using Microsoft Excel</u>

7 <u>Method</u>: This method uses Excel's tool for regression analysis which determines the slope and intercept of straight line data.

8 An exponential equation has the general form: $y = be^{mx}$

9 Taking the natural log of both sides of the equation yields the equation: $\ln(y) = mx + \ln(b)$

10 The equation above is the equation of a straight line with y on a log scale and x on a linear scale.

11 Regression analysis performed on the x data and the $\ln(y)$ data will yield the slope, m, and the intercept, $\ln(b)$.

12

13 Problem 3.18 - Plot C vs W and use regression to find an exponential formula of the form $y = be^{mx}$ (or $C = be^{mW}$)

14 Geiger Counter: Counts per second vs plate thickness

15

16 Measured data from textbook: Extra column Regression data for

17

Plate Thickness	Geiger Counter		for regression:	straight line on graph:	
W (mm)	C (counts per second)		$\ln(C)$	$C = be^{mW}$	
2.0	5500		8.613	5018.4	formula: =B\$47*EXP(B\$43*A19)
5.0	3700		8.216	3981.5	
10.0	2550		7.844	2707.2	
20.0	1300		7.170	1251.6	
27.5	715		6.572	701.8	
32.5	470		6.153	477.2	

25

26 SUMMARY OUTPUT Perform exponential regression as follows:

27 1. Form a column for $\ln(y)$ data - see above

28 *Regression Statistics* 2. Select Tools - Data Analysis - Regression from the menu (see Note below)

29 Multiple R	0.997902337	3. Use the x values for the independent variable and the
30 R Square	0.995809075	$\ln(y)$ values for the dependent variable. For the output range, specify
31 Adjusted R Square	0.994761344	the cell location for the upper left corner of the report.
32 Standard Error	0.069589815	
33 Observations	6	<u>Note</u>: If Data Analysis is not listed under the Tools menu, first

34 select Tools - Add-ins - Analysis Tool Pack

35 ANOVA

36		df	SS	MS	F	ignificance F
37	Regression	1	4.60275	4.60275157	950.4432	6.6E-06
38	Residual	4	0.01937	0.00484274		
39	Total	5	4.62212			

		Coefficients	andard Er	t Stat	P-value	Lower 95%	Upper 95%	.ower 95.0%	Jpper 95.0%
40									
41		Coefficients	andard Er	t Stat	P-value	Lower 95%	Upper 95%	.ower 95.0%	Jpper 95.0%
42	Intercept	8.675157247	0.04943	175.486447	6.33E-09	8.537904	8.812411	8.537904	8.812411
43	X Variable 1	-0.07714813	0.0025	-30.8292587	6.6E-06	-0.084096	-0.0702	-0.084096	-0.0702

45 ln(b) =   8.675157247   Note: From cell B30, R Square =   0.995809 **Good fit!**

46 so b = e^ln(b)

47 | or b = 5855.6 |

49 | m= -0.0771 | so $y = be^{mx}$ or | $C = 5856e^{-0.0771W}$ |

51 Form an xy graph using W = x-axis series, C = 1st series, and $C = be^{mW}$ data = 2nd series.

52 Use a log scales for the y-axis and a linear scale for the x-axis. The data should fall in a straight line.

53 Show points only for the 1st series and line only for the 2nd series.

Counts per second versus Plate Thickness

Geiger Counter, C (counts per second)

y-axis: 1, 10, 100, 1000, 10000

x-axis: 0.0, 5.0, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0

Plate Thickness, W (mm)