

MAR. 21/19

TUES. MAR. 26TH / 6^{PM} - 6^{PM} - EXTRA LECTURE

EX

x	y
1	2.87
2	4.51
3	6.11
4	7.43

- Determine best fit line of the form:

$$y = ax^b$$

$$\ln y = \ln a + b \ln x$$

$$Y = A + Bx$$

x	y	Y = ln y	X = ln x	X _i ²	X _i Y _i
1	2.87	1.0643	0	0	0
2	4.51	1.5063	0.6932	0.4805	1.0442
4	6.11	1.8099	1.3863	1.9218	2.5091
10	7.43	2.0439	2.3026	5.3020	5.1668
Σ		6.6144	4.3821	7.7043	8.7201

$$B = \frac{n \sum X_i Y_i - \sum X_i \sum Y_i}{n \sum X_i^2 - (\sum X_i)^2} \rightarrow \frac{(4)(8.7201) - (4.3821)(6.6144)}{(4)(7.7043) - (4.3821)^2} = 0.5076$$

$$A = \bar{Y} - B\bar{X} = 1.0975$$

$$a = e^A = e^{1.0975} = 2.9969$$

$$b = B = 0.5076 \rightarrow y(x) = 2.9969 x^{0.5076}$$

EX

The best fit of the form $y = ae^{bx}$

$$\ln y = \ln a + b e^{bx} \rightarrow \ln y = \ln a + bx$$

$$Y = a_0 + a_1 X$$

x	y	X = x	Y = ln y	X _i ²	X _i Y _i
0	9.532	0	2.2546	0	0
0.25	7.983	0.25	2.0773	0.0625	0.5193
0.4	4.826	0.4	1.5740	0.16	0.6296
0.5	6.503	0.5	1.7053	0.25	0.8527
Σ		1.15	7.6112	0.4725	2.0016

$$a_1 = \frac{n \sum X_i Y_i - \sum X_i \sum Y_i}{n \sum X_i^2 - (\sum X_i)^2} = \frac{(4)(2.0016) - (1.15)(7.6112)}{(4)(0.4725) - (1.15)^2} = -1.3157$$

$$a_0 = \bar{Y} - a_1 \bar{X} = \left(\frac{7.6112}{4}\right) - (-1.3157)\left(\frac{1.15}{4}\right) = 2.281$$

$$a_1 = b = -1.3157$$

$$a_0 = \ln a \rightarrow a = e^{a_0} = e^{2.281} \rightarrow a = 9.787$$

$$y(x) = 9.787 e^{-1.3157x}$$