The following table of data follows either a linear, exponential, or power form. It is your job to figure out which it is, and then work backwards from the regression equation to an estimate for the actual equation from which the data came.

2.

x	y
2	.594
3	.612
4	.630
5	.649
6	.669
7	.689
8	.709
9	.731
10	.753
11	.775
12	.798
13	.822
14	.847
15	.872

Name_____ AP Statistics Date_____

Adapted from materials from the North Carolina School of Math and Science (Bellaire High School)

Curve Fitting

When we try to fit a curve to a set of data, our goal is to find a function whose graph fits the data well. If the scatter plot indicates that a straight line will not provide a satisfactory fit, we are faced with having to decide just how "curved" the graph of the data is. It is difficult to determine the curvature by looking at the scatter plot. In contrast, we can usually determine visually whether or not a graph is linear or not. Therefore, if we can re-express the original data so that the points lie along a line rather than a curve, we can then determine the function that best models a nonlinear relationship. This process of re-expressing data in order to make it linear will be illustrated in the next several examples.

A. Free - Fall Data

	Time sec	Distance cm
1	0.16	12.10
2	0.24	29.80
3	0.25	32.70
4	0.30	42.80
5	0.30	44.20
6	0.32	55.80
7	0.36	63.50
8	0.36	65.10
9	0.50	124.60
10	0.50	129.70
11	0.57	150.20
12	0.61	182.20
13	0.61	189.40
14	0.68	220.04
15	0.72	254.00
16	0.72	261.00
17	0.83	334.60
18	0.88	375.50
19	0.89	399.10

1. The data in set A is for the distance of a freely falling object. Draw a scatter plot of the data. Write an equation of the regression line through the points. Interpret the slope of the LSRL. Draw the line through the scatter plot. Do you feel that the line is a good model for the data? Explain.

2. Find a quadratic model for this data by fitting the LSRL to the re-expressed ordered pairs $(x, \sqrt{y})$. Using this model, what would you expect the free fall distance to be of an object .63 seconds after falling?

3. Find a quadratic model for this data by fitting a LSRL to re-expressed ordered pairs (x^2, y). Using this model, what would you expect the free fall distance to be of an object .63 seconds after falling?

4. Find a quadratic model for this data by fitting a LSRL to re-expressed ordered pairs $(x, \frac{y}{x})$. Using this model, what would you expect the free fall distance to be of an object .63 seconds after falling?

5. Use a log-log re-expression to find a power function model for this data. Using this model, what would you expect the free fall distance to be of an object .63 seconds after falling?

6. Write a paragraph comparing these models and explaining which you think is best. Include in your discussion any advantages or disadvantages of each re-expression based on characteristics of the phenomenon you are trying to model.