Math 1314
Lesson 3
Spreadsheet View, Making a List and Regressions Using GeoGebra

When you are given raw data about a quantity, rather than a function, you will need to have a method for finding a function that "fits" the data that is given – that is, a function that passes through or passes close to many or most of the points of data that are given. These equations are called **regression equations**. You'll be able to use GGB to find these.

The GGB command for creating these, depending on which you're trying to find, are:
fitpoly[<list of points>, <degree of polynomial>]—*for creating a polynomial function*
fitexp[<list of points>]—*for creating an exponential function*
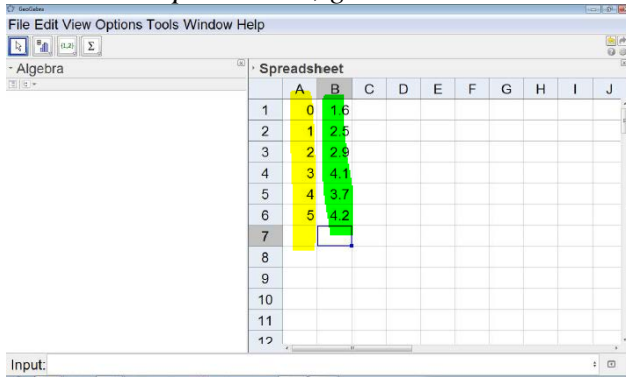fitpow[<list of points>]—*for creating a power function*

Example 1: Suppose you are given the data shown in the table below.

[handwritten notes: quadratic → deg=2, cubic → deg=3, quartic → deg=4, linear → deg=1]

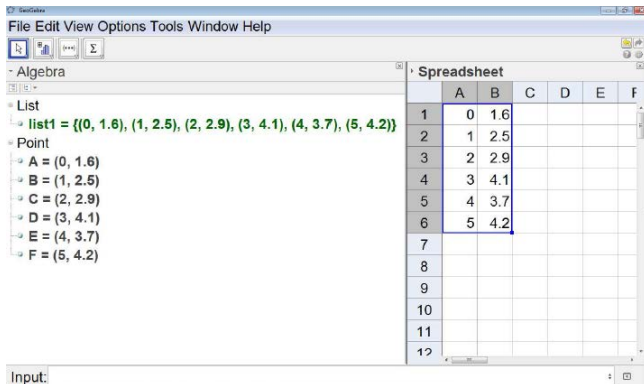| x	0	1	2	3	4	5
y	1.6	2.5	2.9	4.1	3.7	4.2

a. Create a table of values in the spreadsheet view of GGB.
To view the spreadsheet, go to the "View" menu and select "Spreadsheet".

b. Create a list. First, highlight columns A & B. Then find the icon {1,2} at the top left area of the GGB window, click the bottom right corner of the icon and choose "Create List of Points".

c. Find a **linear** regression model.

deg=1

Command: Answer:

$$\text{fitpoly}[\text{list 1, 1}]$$ $$f(x) = 0.5086x + 1.8952$$

d. Find a **quadratic** regression model.

deg=2

Command: Answer:

$$\text{fitpoly}[\text{list 1, 2}]$$ $$g(x) = -0.0929x^2 + 0.9729x + 1.5857$$

e. an exponential regression model.

Command: Answer:

$$\text{fit exp}[\text{list 1}]$$ $$h(x) = 1.9107\,e^{0.1814x}$$

You will also be asked to find a value for regression models called r^2 or R^2. These values are measures of the "goodness of fit" for a regression model, and will be between 0 and 1. The closer the value is to 1, the better the linear regression model predicts the trend of the given data. The closer it is to 0, the less useful it will be in predicting future values. For our purposes in this class, they will give us a piece of information for determining how well a regression equation fits the underlying data.

The command is "RSquare[<List of points>, <Function>].

Example 2: Use the data and the quadratic and exponential regression models that you found in Example 1 to find values for r^2 or R^2 for each of the two regression models.

a. r^2 or R^2 for the quadratic regression model:

Command: Answer:

$$\text{Rsquare}[\text{list 1, g}]$$ $$0.9335$$

b. r^2 or R^2 for the exponential regression model:

Command: Answer:

$$\text{Rsquare}[\text{list 1, h}]$$ $$0.7766$$

Example 3: Suppose that we know the ==revenues== of a company each year since 2005. This information is given in the table below:

x : 0   1   2   3   4   5   7

year	2005	2006	2007	2008	2009	2010	2012
revenues (in millions of dollars)	2.1	2.8	3.4	4.6	7.9	11.2	

Before starting this problem, ==rescale the data== so that the year 2005 corresponds to $x = 0$.

a. Enter the data into the GGB spreadsheet and view the scatterplot in the Graphics window. Then create a list.
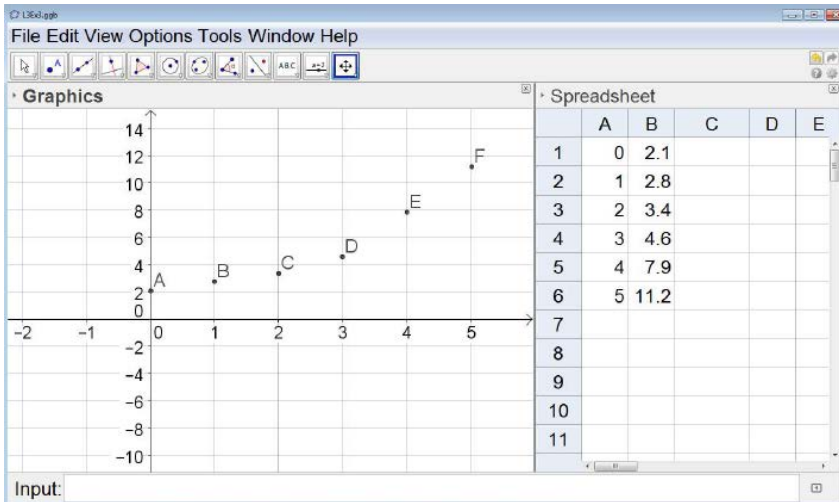
b. Find the cubic and quartic regression models and their respective values for r^2 .

<u>*Cubic Model:*</u>

Command: Command:
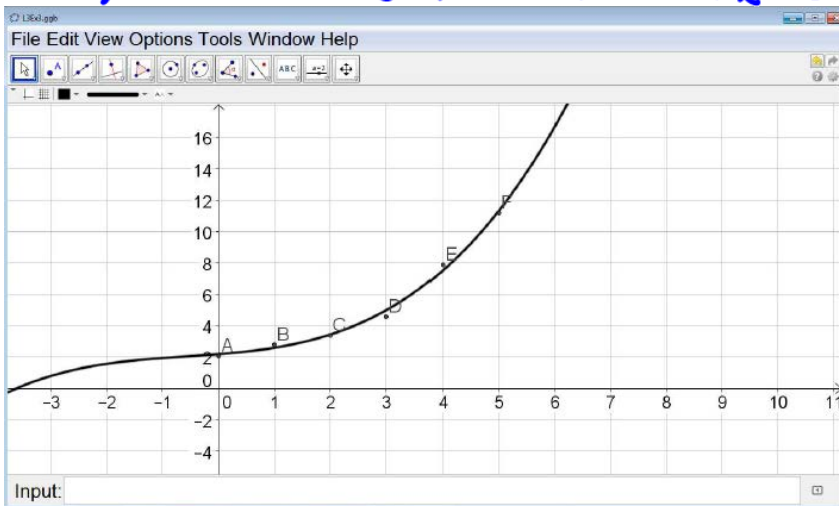
fitpoly[list1 , 3]   Rsquare[list1,f]

Cubic Model: r^2 or R^2 :

$f(x) = .0463x^3 + .0778x^2 + .2807x + 2.1825$ .9943

Quartic Model:
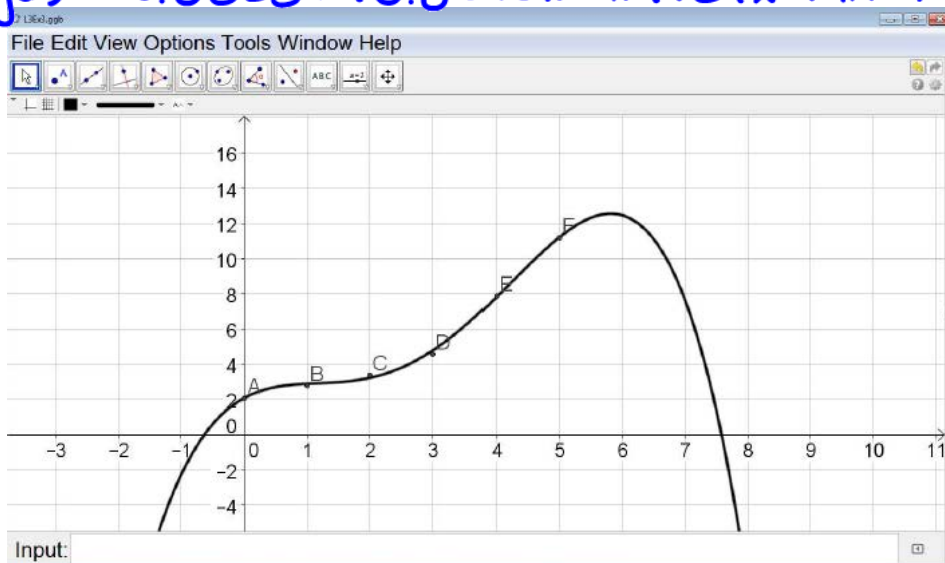
Command:

$$\text{fitpoly}[\text{list1}, 4]$$

Command:

$$\text{Rsquare}[\text{list1}, g]$$

Quartic Model:

$$g(x) = -0.0583x^4 + 0.6296x^3 - 1.7139x^2 + 1.9474x + 2.0825$$

r^2 or R^2:

$$0.9988$$

c. Which model would be the best one to use? Why?

Cubic. Since it "grows" on the far right

d. Use that model to predict revenues in 2012.

Command:

$$f(7)$$

Answer:

\$23.8381 millions