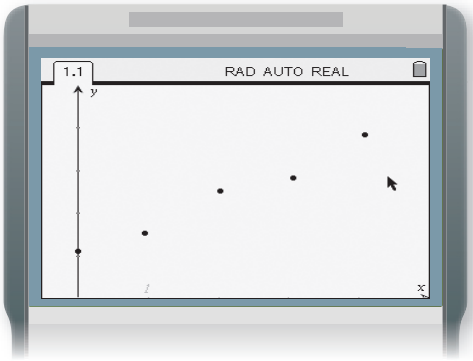
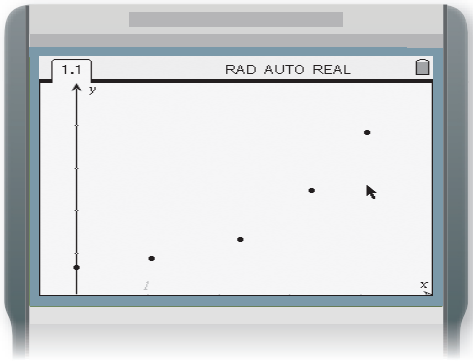
Curve Fitting

If there is a constant increase or decrease in data values, there is a linear trend. If the values are increasing or decreasing more and more rapidly, there may be a quadratic or exponential trend.

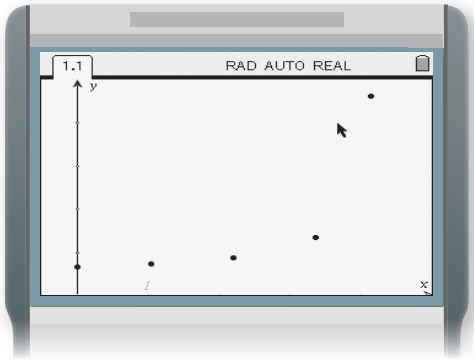
Linear Trend



Quadratic Trend



Exponential Trend



With TI-Nspire technology you can find the appropriate regression equation.

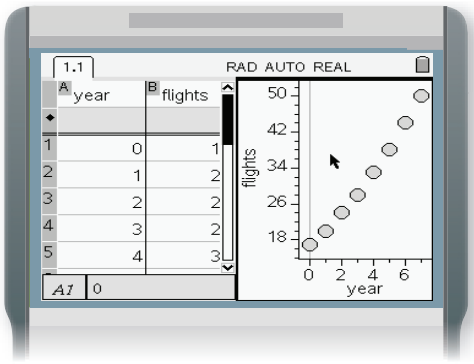
CHARTER AIRLINE **The table shows the average monthly number of flights made each year by a charter airline that was founded in 2000.**

Year	2000	2001	2002	2003	2004	2005	2006	2007
Flights	17	20	24	28	33	38	44	50

Step 1 Make a scatter plot.

Enter the number of years since 2000 in column A and the number of flights in column B. Graph the scatter plot.

KEYSTROKES: (home) 6: New Document 3: Add Lists & Spreadsheet ▲ ▲ Y E A R (enter) ▼ 0 (enter) 1 (enter) ... 7 (enter) ▶ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ F L I G H T S (enter) ▼ 1 7 (enter) 2 0 (enter) ... 5 0 (enter)



Move your cursor to the top of year column. Then create a quick graph of the dots.

KEYSTROKES: ▲ (caps) ▶ (menu) 3: Data 6: Quick Graph

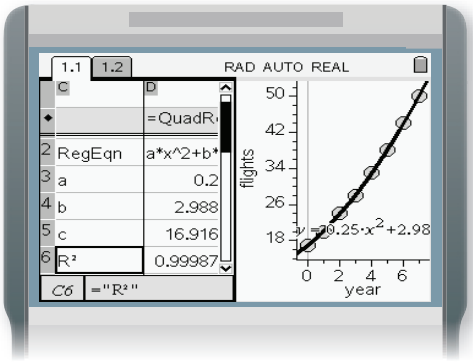
From the scatter plot we can see that the data may have either a quadratic trend or an exponential trend.

Step 2 Find the regression equation.

In the spreadsheet pane, use the **Stat Calculation** option to determine a quadratic regression equation.

KEYSTROKES: ctrl tab menu 4: Statistics 1: Stat Calculations 6: Quadratic Regression

Press enter and select **year** from the list. Press tab and select **flights** from the list. Then press enter.

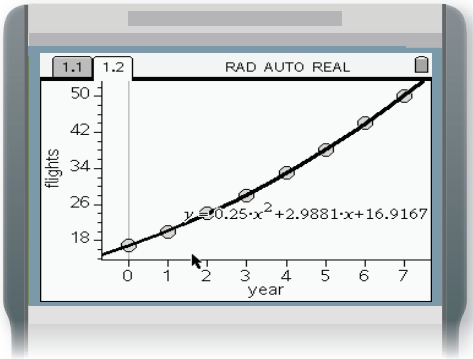


The equation is about $y = 0.25x^2 + 3x + 17$.

R^2 is the **coefficient of determination**. The closer R^2 is to 1, the better the model. To acquire the exponential equation, repeat the above procedure choosing Exponential Regression and saving to **f3**. To choose a quadratic or exponential model, fit both and use the one with the R^2 value closer to 1.

Step 3 Graph the quadratic regression equation.

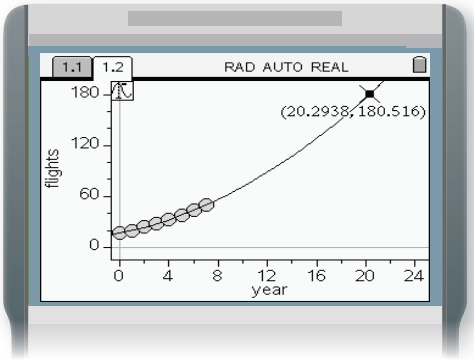
KEYSTROKES: ctrl tab menu 4: Analyze 6: Regression 4: Show Quadratic.



Step 4 Predict using the equation.

If this trend continues, we can use the graph of our equation to predict the monthly number of flights the airline will make in a specific year. Let's check the year 2020. First adjust the window.

Move your cursor into the right end of the **year** axis. Hold your cursor until the hand closes. Drag it to the left until 20 appears on the x-axis. Move your cursor into the top end of the **flights** axis. Hold your cursor until the hand closes. Drag it down until you can see the curve displayed over 20 years.



KEYSTROKES: menu 4: Analyze 8: Plot value 2 0 enter

There will be approximately 180 flights per month if this trend continues.

Plot each set of data points. Determine whether to use a *linear*, *quadratic*, or *exponential* regression equation. State the coefficient of determination.

1.

x	y
1	30
2	40
3	50
4	55
5	50
6	40

2.

x	y
0.0	12.1
0.1	9.6
0.2	6.3
0.3	5.5
0.4	4.8
0.5	1.9

3.

x	y
0	1.1
2	3.3
4	2.9
6	5.6
8	11.9
10	19.8

4.

x	y
1	1.67
5	2.59
9	4.37
13	6.12
17	5.48
21	3.12

5. BAKING Alyssa baked a cake and is waiting for it to cool so she can ice it. The table shows the temperature of the cake every 5 minutes after Alyssa took it out of the oven.

Time (min)	Temperature (°F)
0	350
5	244
10	178
15	137
20	112
25	96
30	89

a. Make a scatter plot of the data.

b. Which regression equation has an R^2 value closest to 1? Is this the trend that best fits the context of the problem? Explain your reasoning.

c. Find an appropriate regression equation, and state the coefficient of determination. What is the domain and range?

d. Alyssa will ice the cake when it reaches room temperature (70°F). Use the regression equation to predict when she can ice her cake.