Name: _____ Group Members: _____

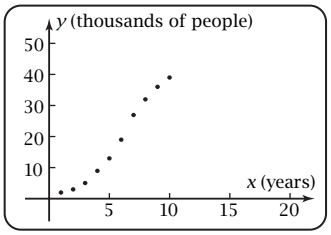
Exploration 7-7a: The Logistic Function for Population Growth

Date: _____

Objective: Fit the logistic function to restricted population growth.

Suppose that what the table lists are populations of a small community, in thousands of people. The figure shows a scatter plot of the data.

x (years)	*y* (thousands of people)
1	2
2	3
3	5
4	9
5	13
6	19
7	27
8	32
9	36
10	39



1. Plot the data on your grapher.
2. At first the population seems to be increasing exponentially with time. On the given figure, sketch the graph of an exponential function that would fit the first six data points reasonably well.
3. Toward the end of the 10-year period, the function seems to be leveling off. A function that models such population growth is the **logistic function.** Its general equation is

$$y = \frac{c}{1 + ae^{-bx}}$$

where x and y are the variables, e is the base of natural logarithm, and a, b, and c stand for constants. The community has room for about 43 thousand people, meaning $c = 43$. Calculate a and b using the first and the tenth points. Write the particular equation, and plot it on the same screen as the data. Sketch the result on the given figure. (Use the space below and the top half of the next column to show your work.)

4. What does the logistic function indicate the population was at time $x = 0$ years?
5. What graphical evidence do you have that the maximum population in the community is 43,000?
6. Look up the word *logistic* in a dictionary, and find the origin of the word.
7. What did you learn as a result of doing this Exploration that you did not know before?