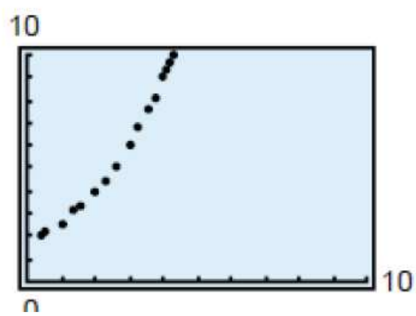
Section 7.5: Modelling Data Using Logarithmic Functions

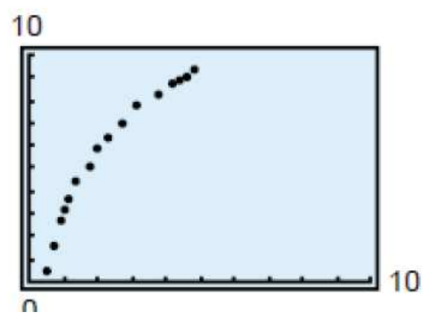
NOTE:

- Domain of a logarithmic function: all positive real numbers
- Logarithmic regressions are mostly used for phenomena that grow quickly at first then slow down over time but the growth continues to increase without bound.
- Exponential regressions are typically used on phenomena where the growth begins slowly then increases very rapidly as time increases.

Example 1:

Which graph is exponential and which is logarithmic?





Example 2:

Create a scatterplot of the data to determine if we should use exponential or logarithmic regression.

x	0.5	0.7	0.9	1.0	1.2	1.4	1.8	2.0	2.3	2.7	3.2	3.8
y	0.5	1.6	2.7	3.1	3.7	4.4	5.1	5.8	6.4	7.0	7.7	8.3

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Example 3:

The flash on most digital cameras requires a charged capacitor in order to operate. The percent charge, Q, remaining on a capacitor was recorded at different times, t, after the flash had gone off.

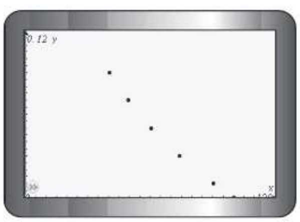
The t.5 flash duration represents the time until a capacitor has only 50% of its initial charge. The t.5 flash duration also represents the length of time that the flash is effective, to ensure that the object being photographed is properly lit.

a) Construct a scatter plot for the given data.
b) Determine a logarithmic model for the data.
c) Use your logarithmic model to determine the t.5 flash duration to the nearest hundredth of a second.

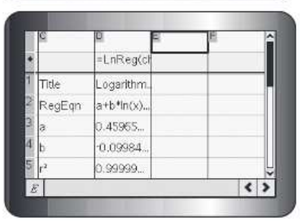
Percent Charge, Q (%)	Time, t (s)
100.00	0
90.26	0.01
73.90	0.03
60.51	0.05
49.54	0.07
40.56	0.09

Rico's Solution

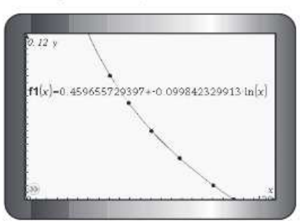
a)



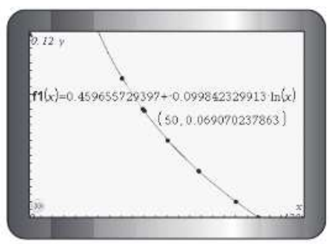
b)



The equation is $y = 0.459... - 0.099...(\ln x)$.



c)



At about 0.07 s, the t.5 flash duration has been reached.

NOTE: Most graphing calculators and spreadsheets provide the equation of the logarithmic regression function in the form:

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

Practice:
p. 466-471, #2,3,4,7