Evaluating Logarithms
ID: 8217

Time required
30 minutes

Activity Overview
In this activity, students explore the logarithm (base 10) function and compare the functions $y = 10^x$ and $y = \log 10^x$ first through a table of values, then through a graph. Negative and fractional values of the function are highlighted. Then students evaluate logarithms base 10 and visually connect logarithm expressions with their equivalent exponential equations. Students will also explore logarithms with other bases via tables, graphs, the calculator application and the change of base formula.

Topic: Exponential & Logarithmic Functions & Equations
- *Evaluate the logarithmic function $f(x) = \log_a(x)$ for any value of x.*
- *Graph exponential functions of the form $f(x) = ab^x$ where a and b are positive real numbers and $b \neq 1$.*
- *Express the inverse of a given exponential function as a logarithmic function and graph it.*

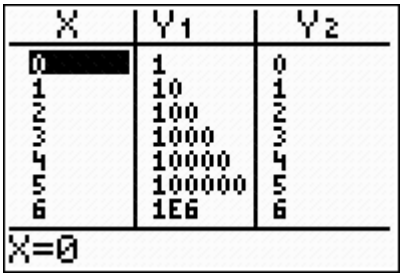
Teacher Preparation and Notes
- *This activity is appropriate for students in Algebra 2 or as a review for Precalculus.*
- *This activity is designed to be **teacher-led** with brief periods of independent student work. By using the computer software and the questions found on the student worksheet, you can lead an interactive class discussion on evaluating logarithms.*
- *Prior to beginning this activity, students should be familiar with the definition of a logarithm and have experience with simple exponential equations of the form $a^x=b$, as well as the exponent rules.*

Associated Materials
- *EvaluatingLogarithms_Student.doc*

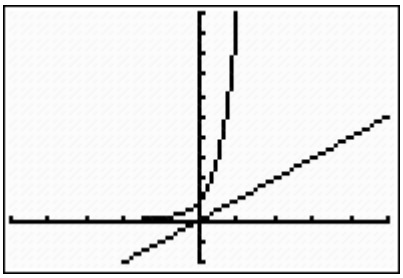
To begin the activity, students will enter $y = 10^x$ and $y = \log(10^x)$ and then view the table of values. They are to determine the values for 10^3 and $\log(10^3)$. They should see that:

$10^3 = 1000$

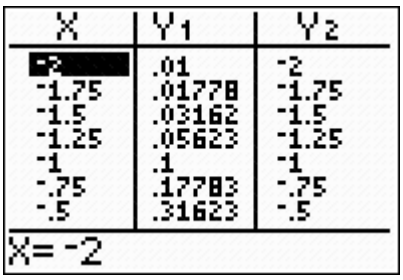
$\log(10^3) = 3$



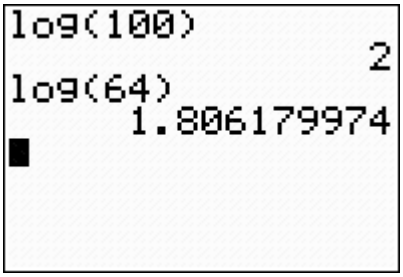
Then students will view the graph of the two functions. Discuss with students why the graph of $y = \log(10^x)$ appears to be the same as the graph of $y = x$.



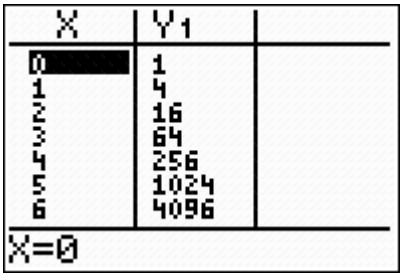
To investigate the functions further, students will adjust the table to view negative exponents and fractional exponents. They should see that the relationships that they noticed earlier remain the same.



On the Home Screen, students are to calculate the logarithm of various values. They should see that the value is the exponent of 10^x.



Students will now investigate what happens when the base of the exponential function is not 10. They are to enter $y = 4^x$ and view its table of values.



Using the change-of-base property, students will evaluate $\log_4 64$ on the Home screen. They should see that the value is the exponent of 4^x.