

Title: Logarithmic functions, inverses and their graphs

Author: Jessica Bartlett

Topics: Logarithmic functions, intercepts, end behavior and the relationship between these inverse functions

Connection to Core Curriculum:

- [CCSS.Math.Content.HSF-IF.C.7e](#) Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Overview: Students will learn about logarithmic and exponential functions graphically using an applet and then algebraically through a worksheet.

Objectives: Students will be able to relate logarithmic and exponential functions through the idea of exponential functions. Students will be able to see the different components of the graphs of these functions including transformations, intercepts, and end behavior.

Materials Needed: Access to the applet.

Web Reference: None

Activity Plan:

1. Review the concept of inverse functions, specifically the fact that to find an inverse function graphically, you reflect the original across the line  $y = x$ . Also, review that the domain and range change roles in inverse functions because of this.
2. Show students to the applet. Write the headers logarithmic function and exponential function on the board with a, b (base), c, d, and e along the left side of the board and explain to the class that as notice how each of these values affects either of the function that they should come to

the board and write a brief description of their conjecture. Have them include their initials as an identifier of each conjecture.

3. Ask the students to also answer the questions at the bottom of the page on the applet.
4. Next, pull students together and discuss new concepts learned from the applet. Make sure students understand how these functions can be transformed, the intercepts, and end behaviors.

Included documents: discussion outline-

Me: Lets go through this table we have created on the board. First (call on a student) read through the conjectures for the value "a" for the logarithmic function...

(Go through each of the points in the table and talk about the conjectures the students made.)

After each of the conjectures have been discussed:

Me: Let's summarize each of these conjectures for a general case. Starting with "a" and the logarithmic function. What can we say in general a coefficient does to the logarithmic function?

Write down on the board in a new table a general case for each of the values and how they transform the functions.

Me: Now, look back at the applet. We have just discussed number one together as a class. Now for number 2: (call on another student), How does reflection the logarithmic function across the line  $y = x$  produce the exponential function? And why is this true?

Listen to the student's response and then ask is anyone has a different way of saying what that student just described. Go through each of the prompts from the applet this way.

Be sure to talk about how a logarithmic function does not have a y-intercept unless transformed a certain way, and that an exponential function does not have an x-intercept unless transformed in a similar way.

References: None.