Exponential Reflections

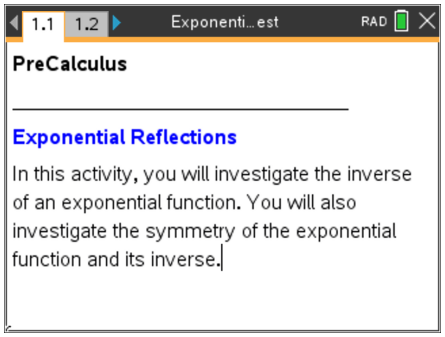
Student Activity

Name _____

Class _____

Open the TI-Nspire document *Exponential_Reflections.tns*

In this activity, you will investigate the inverse of an exponential function. You will also investigate the symmetry of the exponential function and its inverse.



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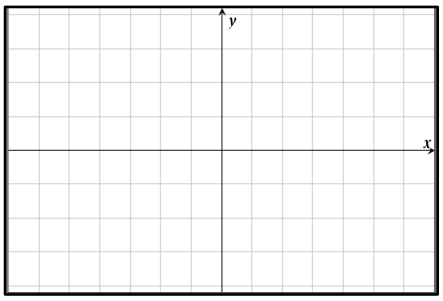
Problem 1 – Reflecting an Exponential Function

1. The exponential function $f(x) = 2^x$ is displayed.

   A function is invertible if each output value is mapped from a unique input value. Is the function $f(x) = 2^x$ invertible? What would the inverse of this graph look like? Sketch the function $y = 2^x$ and its inverse on the grid to the right.



2. Press ctrl T to access a table of values for your function.

   Record the *y*-values under the original *y*-value column in the table below. Recall that if the function $f(x) = 2^x$ consists of input-output pairs (a, b), then the inverse function consists of input-output pairs (b, a).

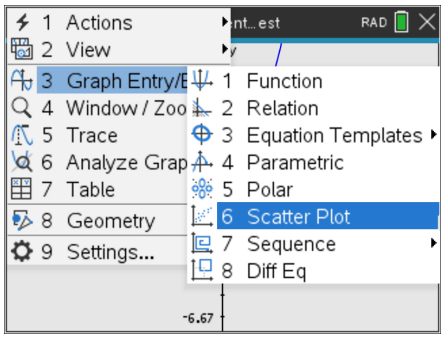
   Next record the inverses of each point by switching the *x*- and *y*-values and recording the results in the inverse columns in the table below.

   Press ctrl T again to return to a full screen of the graph.

Original *x*-value	Original *y*-value	Inverse *x*-value	Inverse *y*-value
–2			
–1			
0			
1			
2			
3			

Move to page 1.3.

3. Enter the inverse values in **invx** and **invy**. Move back to page 1.2.



   To set up the scatter plot of the two lists, press menu and select 3 Graph Entry/Edit and then 6 Scatter Plot. For the x, press var and select invx. For the y, press var and select invy. Press enter.

   Do your plotted points appear to be on the graph of the inverse function that you sketched in Question 1?

4. The inverse of a general exponential function $f(x) = b^x$ is a logarithmic function of the form $g(x) = log_b x$. Write the inverse of $f(x) = 2^x$.

5. Check your result by graphing this function in $f2(x)$ to see if it passes through all the plotted points. Also graph the identity function $f3(x) = x$. Are the two graphs symmetric with respect to the line $y = x$?

   Note: To return to graphing a function, press menu and select 3 Graph Entry/Edit and then 1 Function. The $log_b x$ is found by pressing ctrl log.

Move to page 2.1.

Problem 2 – The inverse of $f(x) = e^x$. This function has a natural base of ***e***.

6. Graph $f1(x) = e^x$. Repeat the steps of **Problem 1** using $f(x) = e^x$.

   What is the inverse of $f(x) = e^x$.

Note: The inverse of $f(x) = e^x$ is called a Natural Logarithmic function.

Move to page 3.1.

Problem 2 – The inverse of $f(x) = 10^x$.

7. Graph $f1(x) = 10^x$.

   Find the inverse of $f(x) = 10^x$. Check the symmetry of the function and its inverse by graphing.

Note: The inverse of $f(x) = 10^x$ is called a Common Logarithmic function.