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| You may have noticed the log button on the handheld. What does *log* mean? Right above the log button is an exponential key . Why is the placed above the log button? You will investigate these questions in this activity. |  |

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| **Go to the *y =* screen and follow the directions below.**  1. In , graph the function  a. What are the domain and range of this function in  b. Recall that is a one-to-one function, so it has an inverse reflected over the line *y* = *x*. Graph this line into . What are the domain and range of *f–1*(*x*)?    c. Press **graph**, then **trace**. The coordinates you see at the bottom of the screen is a point on the function . Move the cursor left and right using the arrows, on the axis below, sketch what you think the reflection over the line would look like. Write a corresponding equation for what you think the function is.        d. The equation *x* = 2*y* cannot be written as a function of *y* in terms of *x* without new notation. The inverse of *f*(*x*)is actually . In general, log*b* *x* = *y* is equivalent to *by = x* for *x* > 0, *b* > 0 and *b* ≠ 1. Why do you think *x* and *b* must be greater than 0? Why can *b* not be equal to 1?  e. Enter the following function into and press graph: . On the graph screen, while using **trace**, use the left/right arrows to trace a function, use the up/down arrows to toggle between functions. While on the exponential function, press the number 1 then **enter**. This point has coordinates of (1, 2). The point (1, 2) on *f*(*x*) = 2*x* indicates that 21 = 2. Move the cursor to the logarithmic function and press 2 then **enter**. This point has the coordinates. The point (2, 1) on  indicates that log2 2 = 1. Use this relationship between exponential expressions and logarithmic expressions to complete the following table. (Use the trace function as necessary.) |
| |  |  |  |  | | --- | --- | --- | --- | | ***P*** | ***P'*** | **Exponential Expression** | **Logarithmic Expression** | | (1, 2) | (2, 1) | 21 = 2 |  | | (2, 4) |  |  |  | |  | (8, 3) |  |  | |  |  | 20 = 1 |  | |  |  |  |  | |  |  |  |  | |  |  |  |  |     2. You have discussed the idea of reflecting the exponential function over the line . The result of   this reflection is the logarithmic function. Now we will discuss any tabular relationships that are formed   between an exponential function and a logarithmic function.  Using the first and second columns from the table above, fill in the following tables.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | -3 |  | | -2 |  | | -1 |  | | 0 |  | | 1 |  | | 2 |  | | 3 |  | | |  |  | | --- | --- | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  |  |  |  | | --- | --- | |  |  | |  |  | |  |  | |  |  | | 1 |  | | 2 |  | | 4 |  | | 8 |  | |  1. Briefly explain your process of filling in the tables on the previous page. 2. With a classmate, discuss and describe the patterns you see in each individual column. 3. Write down a rule for each table that you can use to classify the function as either exponential or logarithmic. |
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| 3. Solve the logarithmic equation log232 = *y* using the patterns from questions 1 and 2. How does the exponential equation verify your result? |
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| 4. Solve the equation using the patterns from questions 1 and 2. How does the exponential equation verify your result? |
| 5. Maya solved the logarithmic equation. She says the answer is 4 since 4 × 4 = 16. Is her answer correct? Why or why not?  6. Alex says that when solving a logarithmic equation in the form log*b a* = *y*, he can rewrite it as *ba* = *y*. Is this a good strategy? Why or why not? |