College Prep Algebra
Lesson: Friday, April 10, 2020

Learning Target:
Determine the inverse of an exponential graph and how to write the inverse of an exponential.

Let's Get Started:
What is meant by Inverse when we are in math?
Watch this video by Khan Academy. STOP at 5:20

Lesson:

So we find out that inverse is kind of like “reverse”.
The inverse of add is subtract.

The inverse of multiply is divide.

What is the inverse of an exponential?

Just think about that a moment.

So, what is the inverse of an exponential?

Well, an exponent counts how many times a base repeatedly multiplies itself

$$5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$$

So the inverse of an exponential would count how many times a base can repeatedly divide a number.

The word that means repeated division is Logarithm.

It is strange that we have an inverse that is a WORD.

How to write the inverses of exponentials with logarithms.

Here is an exponential $5^4 = 625$

To write it's inverse, we want to take 625 and divide it repeatedly by 5. The word logarithm means repeated division and mathematicians decided to write it this way.

$$\log_5 625 = 4$$

Before we start working with logarithms, let's see how exponential graphs and logarithmic graphs relate to each other.

View this Khan Academy video to see how inverse graphs relate

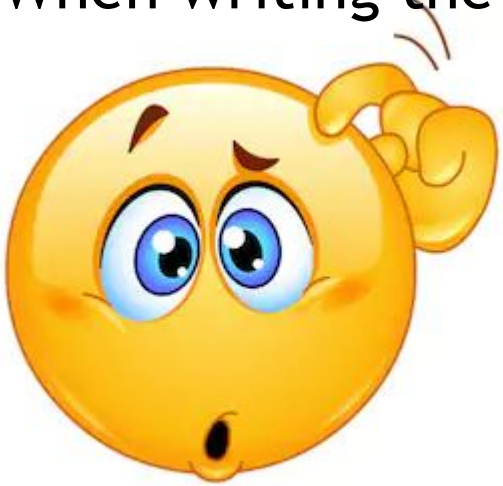
So inverse graphs

1) Switch the x and y values
2) Reflect over the $y=x$ line.

How to write the inverses an exponential function as a logarithm.

Here is an exponential function $f(x) = 7^{x-1} + 3$

When writing the inverse, we want to divide by 7 repeatedly.



$$f^{-1}(x) = \log_7(x)$$

But now, what about the -1 and the +3?

Look carefully at the exponential function $f(x) = 7^{x-1} + 3$

When you learned to transform graphs,
you would have said

f(x) is the graph 7^x moved

- *up 3, a positive y direction, and*
- *right 1, a positive x direction*

Since **inverse functions switch the *x* and the *y***,
the inverse needs to **<u>also switch the moves of the inverse function</u>**.

$f^{-1}(x)$ is the graph $\log_7(x)$ moved

- *right 3, a positive x direction, and*
- *up 1, a positive y direction.*

$$f^{-1}(x) = \log_7(x - 3) + 1$$

Practice:

Use this DESMOS Activity to
practice inverses of exponentials known as logarithms.

Slides 14, 15, and 16 are challenge inverses for fun!

Discovering Logarithmic Functions

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Additional Practice:

Click on the links below to get additional practice and to check your understanding!

More Practice on Khan Academy