

Target 7-1
Target 7-3

Stick Quiz 7.3

Rewrite each logarithmic equation in exponential form. Then solve.

1. $\log_6 x = 2$ $6^2 = x$ $x = 36$ 2. $\log_x 625 = 4$ $x^4 = 625$ $x = 5$

Name the parent function, the transformations, the domain and range, and then graph both.

3. $y = 2\log_{1/3}(x+2)$

P: $y = \log_{1/3} x$

$a = 2$

$h = -2$

$k = 0$

← $D: x > -2$
 $k: \mathbb{R}$

$$y = ab^x$$

4. Write the exponential equation
for growth
for decay
for compound interest

$$y = a(1+r)^t$$

$$y = a(1-r)^t$$

$$y = a\left(1 + \frac{r}{n}\right)^{nt}$$

Newberg currently has approximately 23,000 residents. However, it is becoming an increasingly popular place to live. As such, the population is growing by 100% a year. Write a function to represent this scenario.

Let x represent the years since 2014. At this rate what will the population be in 2025?

A certificate of deposit (CD) pays 2.25% annual interest compounded biweekly. If you deposit \$500 what will your balance be after 6 years?

$$\begin{array}{ccc} \text{Growth} & \text{Decay} & \text{Compound} \\ y = a(1+r)^t & y = a(1-r)^t & y = a\left(1 + \frac{r}{n}\right)^{nt} \end{array}$$

Homework Questions?

Graphing Logs

#47

$$f(x) = -\frac{1}{6} \log_8 (x-3) + 4$$

The parent function is: $y = \log_8 x$

$a = -\frac{1}{6}$, which means v flip v shrink

$h = +3$, which means Right 3 D: x+3

$k = 4$, which means up 4

$y = \log_8 x \rightarrow$

$$y = 8^x$$

-1	1/8
0	1
1	8

$$8^y = x$$

x	y
1/8	-1
1	0
8	1

x	y
3.125	4.16
4	4
11	3.83

(Handwritten note: $y = (-\frac{1}{6}) + 4$)

Graphing Logs

$$f(x) = -2 \log_4 x$$

The parent function is: _____

$a =$ _____, which means _____

$h =$ _____, which means _____

$k =$ _____, which means _____

LESSON 7-4 Solving Logarithmic Equations and Inequalities

I can use the properties of logarithms to write and solve equations.

Solve:

$$300 = 10^x$$

$$a = b^x$$

$$\log_b a = x$$

$$\log_{10} 300 = x$$

$$x \approx 2.5$$

$$47 = 10^x$$

$$0.01 = 10^x$$

★ Logarithm Change-of-Base Property

$$\log_b a = \frac{\log a}{\log b} \quad \text{where } a > 0 \text{ and } b > 0$$

$$4^x = 128$$

$$x = \log_4 128$$

$$x = \frac{\log 128}{\log 4}$$

$$x = 3.5$$

$$\log_4 128 = x \quad \checkmark$$

$$\frac{\log 128}{\log 4} = x$$

$$4^{3.5} =$$

$$3^x = 102$$

$$5^x = 125$$

$$9^x = 500$$

$$\log_7 7 = x$$

Write $4^{-3} = \frac{1}{64}$ in logarithmic form.

$$\log_4 \frac{1}{64} = -3$$

Write $\log_6 216 = 3$ in exponential form.

Solve $\log_8 x = \frac{4}{3}$.

$$8^{\frac{4}{3}} = x$$

$$x = 16$$

$$\log_8 16 =$$

Notice: Log is only on one side!
When you have only 1 log you can convert to exponential.

You Try

Solve $\log_{27} n = \frac{2}{3}$.

Notice: Log is only on one side!
When you have only 1 log you can convert to exponential.

Solve $\log_{2x} 16 = -2$

*If b is a positive number other than 1,
then $\log_b x = \log_b y$ if and only if $x = y$.*

And this means.....

$$\text{If } \log_5 x = \log_5 8, \text{ then } x = 8$$

Both sides have a LOG with the same base.
This means you can set the "insides" equal to each other.

Solve $\log_7(2x + 8) = \log_7(x + 5)$. $\log_7 2 = \log_7 2$ ✓

$$\begin{array}{r} 2x+8 = x+5 \\ -x-8 \quad -x-8 \\ \hline x = -3 \end{array}$$

Solve $\log_4 x^2 = \log_4(-6x - 8)$.

$$x = -2 \quad \checkmark$$

$$\log_4 4 = \log_4 4$$

$$x = -4 \quad \checkmark$$

$$\begin{array}{r} x^2 = -6x - 8 \\ +6x + 8 \quad +6x + 8 \\ \hline x^2 + 6x + 8 = 0 \\ (x+2)(x+4) = 0 \\ \hline x = -2 \quad x = -4 \end{array}$$

$$\log_4 16 = \log_4 16$$

You Try

Solve $\log_4 x^2 = \log_4(x + 20)$.

Solve $\log_7(4x + 5) = \log_7(5x + 1)$.

Special cases - negatives

$$\text{Solve } \log_4(2x - 4) = \log_4(3x).$$

Why?

If the base b is always positive it doesn't matter what power you raise it to it will still yield a positive answer!

Special cases - whole numbers

$$\log_4 4 = x$$

$$\log_5 5 = x$$

So the number 1 can be changed into a LOG with any base you want as long as it's "a" is the same as "b".

Special cases - whole numbers

$$\log_4 16 = x$$

$$\log_8 64 = x$$

So the number 2 can be changed into a LOG with any base you want as long as it's b squared equals a.

And the number 3...

$$\log_4 2x = 5$$

Haley tries to solve the equation above and she got the wrong answer. What is her mistake? What should the correct answer be?

$$\log_4 2x = 5$$

$$2x = 4^5$$

$$x = 2^5$$

$$x = 32$$

An equation for loudness, in decibels, is $L = 10 \log_{10} R$ where R is the relative intensity of the sound. Sounds that reach levels of 120 decibels or more are painful to humans. What is the relative intensity of 120 decibels?

Homework 7.4

(Day 5) 7.4 Worksheet in packet

Note #9 should be: $\log_x 16 = x$

Note #9 has a typo, please change to:

$$9. \quad \log_{x+4} 27 = 3$$