

Stick Quiz 7.4

Solve

1. $\log_4 x^2 = \log_4 (4x + 21)$ $x = -3 \quad x = 7$

2. $\log_7 (6x - 3) = \log_7 (4x + 3)$ $x = 3$

3. $300 = 10^x$ $\log_{10} 300 = x$ $x \approx 2.48$

Graph, note parent, transformations and domain and range:

$f(x) = \log_2 (x - 2)$

$p: y = \log_2 x$

$h = 2$ Right 2

$D: x > 2$

$R: \mathbb{R}$

Homework Questions?

$$1. \log_2 32 = 3x$$

$$\frac{\log 32}{\log 2} = 3x$$

$$8. \log_2(x^2 - 6) = \log_2(2x + 2)$$

$$\begin{array}{r} -8 \quad -2 \\ \hline \end{array} \quad \begin{array}{r} x^2 - 6 = 2x + 2 \\ \underline{-2x - 2} \\ x^2 - 2x - 8 \end{array}$$

$$x^2 - 2x - 8 = 0$$

$$(x - 4)(x + 2) = 0$$

$$\boxed{x = 4} \quad x = -2$$

$$\log_{x+4} 27 = 3$$
$$\left((x+4)^3 \right)^{1/3} = (27)^{1/3}$$

$$x+4 = 3$$
$$\begin{array}{r} -4 \\ -4 \end{array}$$
$$x = -1$$

LESSON 7-5 Properties of Logarithms

I can use the properties of logarithms to write and solve equations and interpret real world scenarios.

7.5 Properties of Logarithms

Last class....

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

The 10 is invisible when dealing with the common log (base 10)

$$a = b^x \text{ is the same as } \log_b a = x$$

We can rewrite exponents as logarithms.

$$\log_b a = \frac{\log a}{\log b}$$

Change of Base Property.



Product Property

$$a^m a^n = a^{m+n}$$

or

$$\log_a xy = \log_a x + \log_a y$$

$$\begin{aligned} &\log_2(2x) + \log_2 3 \\ &\log_2(2x \cdot 3) \\ &\log_2(6x) \end{aligned}$$

Rewrite the expressions

1. $\log_2(4y)$

$$\log_2 4 + \log_2 y$$

2. $\log_3 7 + \log_3 5$

$$\log_3 35$$

$$3^2 \cdot 3^5 = 3^7$$

$$3^6 \cdot 3$$

Rewrite then solve.

Recall: $3^2 \cdot 3^x = 3^{10}$
 $3^{2+x} = 3^{10}$
 $2+x=10$
 $x=8$ ✓

3. $\log_3 x + \log_3(3x-5) = \log_3 2$

$$\log_3 x(3x-5) = \log_3 2$$

$$x(3x-5) = 2$$

$$3x^2 - 5x = 2$$

$$3x^2 - 5x - 2 = 0$$

$$(3x^2 - 6x) + (x - 2) = 0$$

$$3x(x-2) + 1(x-2) = 0$$

$$(x-2)(3x+1) = 0$$

$$x-2=0$$

$$\boxed{x=2}$$

$$3x+1=0$$

$$-1 \quad -1$$

$$\frac{3x}{3} = \frac{-1}{3}$$

~~$$x = -\frac{1}{3}$$~~

a	c	b
-6		-5
-6	1	
6x	x	+

You Try

$$4. \log_4 5 + \log_4 x = \log_4 60$$

$$x = 12$$



And more...

Quotient Property

$$\frac{a^m}{a^n} = a^{m-n}$$

or

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

$$\log x^2 - \log x$$

$$\log \frac{x^2}{x}$$

$$\log x$$

Rewrite the expressions

5. $\log_4 \left(\frac{2}{7} \right)$

$$\log_4 2 - \log_4 7$$

6. $\log_8 12 - \log_8 4$

$$\log_8 \frac{12}{4}$$
$$\log_8 3$$

Rewrite then solve.

7. $\log_{10} y - \log_{10}(2 - y) = 0$

$$\log_{10} \frac{y}{2-y} = 0$$

$$10^0 = \frac{y}{2-y}$$

$$(2-y)1 = \frac{y}{2-y} (2-y)$$

$$2-y = y$$

$$+y \quad +y$$

$$\frac{2}{2} = \frac{2y}{2}$$

$$y = 1$$

You Try

$$8. \log_2 k - \log_2 3 = \log_2 7$$

Properties are fun!



Power Property

$$\log_a x^n = n \log_a x$$

Rewrite the expressions

$$9. \log_9 \sqrt{2}$$
$$\log_9 2^{1/2}$$
$$\frac{1}{2} \log_9 2$$

$$10. 5 \log(2x)$$
$$\log(2x)^5$$

Rewrite then solve.

$$11. 3 \log_7 4 = 2 \log_7 h$$

$$\log_7 4^3 = \log_7 h^2$$

$$4^3 = h^2$$

$$64 = h^2$$

$$\boxed{h=8}$$

You Try

12. $\log_7 n = \frac{2}{3} \log_7 8$

13. $2 \log_2 10 = x$

All properties possible!

14. $\log_3 y = -\log_3 16 + \frac{1}{3} \log_3 64$

$$\log_3 y = \log_3 16^{-1} + \log_3 64^{1/3}$$

$$\log_3 y = \log_3 16^{-1} \cdot 64^{1/3}$$

$$y = 16^{-1} \cdot 64^{1/3}$$

$$y = .25 \text{ or } y = \frac{1}{4}$$

Homework 7.5

7.5 Pg488 #23-26, 36-49, 51-57o

The next three pages are extra problems
from last years slides

Rewrite the expression as a sum or difference.

YOUR TURN

$$1. \log_1 4xy$$

$$2. \log \frac{5a}{x}$$

$$3. \log_5 \frac{7}{ab}$$



Determine if the equation is true or false.

$$4. \log 8 + \log 2 = \log 10$$

$$5. \log 3 + \log 5 - \log 7 = \log 15/7$$

$$6. \log 2 - \log 3 - \log 5 = \log 2/15$$

Rewrite the expression.

YOUR TURN

$$1. x \log_8 4$$

$$2. (3^{0.5})^2$$

$$3. \log (5x)^2$$



Solve the equations.

$$4. 2 \log_2 10 = x$$

$$5. (0.5^3)^{0.8} = x$$

$$6. \log_3 \frac{\sqrt[3]{4}}{5} = x$$

Determine if the statement is true or false.

YOUR TURN

1. $\log \frac{1}{2^4} = 4 \log 2$



2. $8^{x/-2} = \sqrt{8^x}$



3. $\log \sqrt[3]{7} = -3 \log 7$

Solve the equations.

4. $3.6^x = 21$

5. $31(8.2)^x = 214$

6. $0.8^{4/3} = x$