Unit 10 Day 2 HW

Unit 9 Day 2 HW

1. $x = \frac{1}{2}$
2. $x = 2/3$
3. $x = 3$ $y=64$ (3,64)
4. $3^7 = 2187$
5. $5^{-2} = 0.04$
6. $\log_4 \frac{1}{1024} = -5$
7. $\log_{16} 2 = \frac{1}{4}$
8. $x = 4$
9. $x = 0$
10. $x = 1/5$
11. $x = 3$
12. $x = 9$
13. $x = 36$
14. $x = 3$
15. $x = 6$
16. $x = 3$

Name_____ Alg 2 CC

Date_____ Unit10HW Day 2

1. Solve for x.

$25^{x+1} = 125$

$5^{2(x+1)} = 5^3$

$2x+2 = 3$

$2x = 1$

$x = \frac{1}{2}$

2. Solve for x.

$7^{3x} = 49$

$7^{3x} = 7^2$

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

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

3. Algebraically determine the intersection point of the two exponential functions shown below. Recall that most systems of equations are solved by substitution.

$y = 8^{x-1}$ and $y = 4^{2x-3}$

$8^{x-1} = 4^{2x-3}$

$2^{3(x-1)} = 2^{2(2x-3)}$

$3x-3 = 4x-6$

$-3x+6 \quad -3x+6$

$3 = x$

$y = 8^{3-1} = 8^2 = 64$

$(3, 64)$

For questions 4 through 5, restate each logarithmic equation as an exponential equation.

4. $\log_3 2187 = 7$ $3^7 = 2187$

5. $\log_5 0.04 = -2$ $5^{-2} = 0.04$

For questions 6 and 7, restate each exponential equation as a logarithmic equation.

6. $4^{-5} = \frac{1}{1024}$ $\log_4 \frac{1}{1024} = -5$

7. $16^{1/4} = 2$ $\log_{16} 2 = 1/4$

For questions 8 through 11, evaluate.

8. $\log_2 16 = x$ $2^x = 16$ $2^x = 2^4$ $x = 4$

9. $\log_6 1 = x$ $6^x = 1$ $x = 0$

10. $\log_{32} 2 = x$ $32^x = 2$ $2^{5x} = 2^1$ $5x = 1$ $x = 1/5$

11. $\log_{\frac{1}{2}} \frac{1}{8} = x$ $\frac{1}{2}^x = \frac{1}{8}$ $2^{-x} = 2^{-3}$ $x = 3$

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

For questions 12 through 16, solve.

12. $\log_x 81 = 2$

$\sqrt{x^2} = \sqrt{81}$ $x = 9$

$x = \pm 9$

reject -9

13. $\log_6 x = 2$

$6^2 = x$ $x = 36$

14. $\log_{\frac{1}{27}} x = -\frac{1}{3}$ $\left(\frac{1}{27}\right)^{-1/3} = x$

$x = 27^{1/3} = \sqrt[3]{27} = 3$

$x = 3$

15. $\log_2 64 = x$ $2^x = 64$ $x = 6$

$2^x = 2^6$

16. $2 = \log_x 9$ $\sqrt{x^2} = \sqrt{9}$

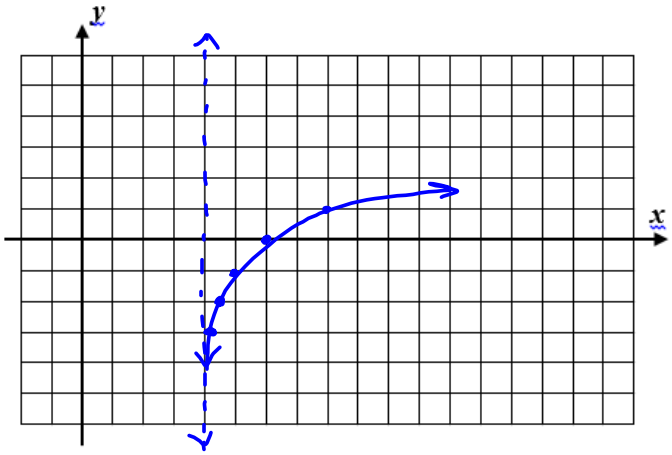
$x = \pm 3$ $x = 3$

reject 3

Properties of Logarithms

Properties of Logarithmic Functions Unit 10 Day 3

Warm-up: Graph the logarithmic function $y = \log_2(x-4) - 1$ on the graph below.



$y = 2^x$

x	-2	-1	0	1	2
y	1/4	1/2	1	2	4

$y = \log_2 x$

x	1/4	1/2	1	2	4
y	-2	-1	0	1	2

$y = \log_2(x-4) - 1$

x (+4)	4 1/4	4 1/2	5	6	8
y	-3	-2	-1	0	1

Most calculators only have two logarithms that they can evaluate directly. One of them, $\log_{10} x$, is so common that it is actually called the **common log** and typically is written without the base 10.

$$\log x = \log_{10} x \quad \text{(The Common Log)}$$

Properties of Logs

$\log_{10} x = 4 \rightarrow$ $10^4 = x$ $10{,}000 = x$

common log →

$\log_{10} 10 = 1$

$\log_{10} 100 = 2$

$\log 1{,}000 = 3$

$\log .1 = -1$

$\log .01 = -2$

$\log .001 = -3$

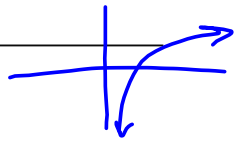
6

LAWS OF LOGS

	Exponential Rule	Logarithmic Rule	Example of Log Rule
Product	$(x^m)(x^n) = x^{m+n}$	$\log_b mn = \log_b m + \log_b n$	$\log_b 15 \overset{5\cdot3}{=} \log_b 5 + \log_b 3$
Quotient	$\frac{x^m}{x^n} = x^{m-n}$	$\log_b \frac{m}{n} = \log_b m - \log_b n$	$\log_b \frac{145}{12} = \log_b 145 - \log_b 12$
Power	$(x^m)^n = x^{mn}$	$\log_b m^n = n \log_b m$	$\log_b 5^2 = 2 \log_b 5$
Root	$\sqrt[n]{x} = x^{1/n}$	$\log_b \sqrt[n]{x} = \log_b x^{1/n} = \frac{1}{n}\log_b x$	$\log_b \sqrt[3]{10} = \log_b 10^{1/3}$ $\frac{1}{3}\log_b 10$
Inverse	$b^{\log_b x} = x$	$\log_b b^x = x$	$\log_7 7^5 = 5$

**Remember: Can't take the log of a (-) # or zero

∴ Log Domain: $x > 0$ $(0, \infty)$



Fill out the laws of logs sheet and then complete the following.

1. Expand: $\log x^2y$ $= \log x^2 + \log y$

$2\log x + \log y$

2. Expand: $\log\frac{x^2}{y}$ $= \log x^2 - \log y$

$2\log x - \log y$

3. Expand: $\log\frac{m^2}{p\sqrt{s}}$ $= \log m^2 - \log(ps^{1/2})$

$\log m^2 - (\log p + \log s^{1/2})$

$2\log m - \log p - \frac{1}{2}\log s$

4. Express $\log\left(\sqrt[3]{\frac{m}{n}}\right)$ in terms of log m and log n.

$\log\left(\frac{m}{n}\right)^{1/3} = \frac{1}{3}\log\left(\frac{m}{n}\right) = \frac{1}{3}(\log m - \log n) = \frac{1}{3}\log m - \frac{1}{3}\log n$

or $\log\frac{m^{1/3}}{n^{1/3}} = \log m^{1/3} - \log n^{1/3} = \frac{1}{3}\log m - \frac{1}{3}\log n$

5. If $x = \frac{\sqrt{r}}{s}$, what is log x?

$\log x = \log\left(\frac{\sqrt{r}}{s}\right)$

$\log x = \log\left(\frac{r^{1/2}}{s}\right) = \frac{1}{2}\log r - \log s$

$\log r^{1/2} - \log s$

6. Find an equivalent expression to $\log\left(\frac{x^3 y^{\frac{1}{2}}}{100}\right)$

$\log x^3 y^{1/2} - \log 100$

$\log x^3 + \log y^{1/2} - \log 100$

$3\log x + \frac{1}{2}\log y - \log 100 = 3\log x + \frac{1}{2}\log y - 2$

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7. Find an equivalent expression to $\log \frac{10x}{y}$

$\log 10x - \log y$

$\log 10 + \log x - \log y$

1

$1 + \log x - \log y$