Warm-up

Monday, April 20, 2015

Get your homework out ready for checking.

1. Write the new equation of $g(x) = 3^x$ given the following transformations: **Shift left 3 and up 4.**

2. Calculate the total dollar amount available after **10** years when **$3,000** is invested at an annual interest rate of **2%.**

3. Calculate the total dollar amount available after **10** years when **$3,000** is invested at an annual interest rate of **2%** when interest is **compounded monthly**.

10
9
8
7
6
5
4
3
2
1

1st Block

FRONT OF ROOM

		Caleb P.(4)	Kacie (Mary B.) (9)	Raul V. (2)	Ariany A. (12)
Joanna C. (7)	Casey A. (13)	Treyvon T. (1)	Jazz B. (11)	Jordan J.	Makayla Ch. (5)
Micah M. (25)	Daniella A. (14)	Mijanou A. (10)	Melissa C.(22)	Justin B. (8)	Manual F. (21)
Courtney S. (24)	Sierra B.	Arthur M.(23)	Kayla H.	Bruce C. (17)	Malik M. (20)
	Trya O. (6)	DeAnthony C. (15)	Makayla B. (18)	Tristan W. (3)	Tavion W. (Teyy) (19)
Sandra L. (16)	Tia M.	Frida F.	Timothy C. (TJ)		Leslie P.

Homework Review…

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1. $y = 4x - 5$
   $f^{-1} = \frac{x + 5}{4}$

2. $y = 3x^3 + 2$
   $f^{-1} = \sqrt[3]{\frac{x - 2}{3}}$

3. $y = (x + 1)^3$
   $f^{-1} = \sqrt[3]{x} - 1$

4. $y = 0.5x + 2$
   $f^{-1} = 2x - 4$

5. $f(x) = x + 3$
   $f^{-1}(x) = x - 3$

6. $f(x) = 2(x - 2)$
   $f^{-1}(x) = \frac{x + 4}{2}$

7. $f(x) = \frac{x}{5}$
   $f^{-1}(x) = 5x$

8. $f(x) = 4x + 2$
   $f^{-1}(x) = \frac{x - 2}{4}$

9. $y = x$
   $f^{-1} = x$

10. $y = x - 3$
    $f^{-1} = x + 3$

11. $y = \frac{x - 1}{2}$
    $f^{-1} = 2x + 1$

12. $y = x^3 - 8$
    $f^{-1} = \sqrt[3]{x + 8}$

13. $f(x) = \sqrt{x + 2}$
    $f^{-1}(x) = x^2 - 2$ for $x \geq -2$

14. $f(x) = \frac{2}{3}x - 1$
    $f^{-1}(x) = \frac{3}{2}(x + 1)$

15. $f(x) = \frac{x + 3}{5}$
    $f^{-1}(x) = 5x - 3$

16. $f(x) = 2(x - 5)^2$
    $f^{-1}(x) = 5 \pm \sqrt{\frac{x}{2}}$

17. $y = \sqrt{x} + 4$
    $f^{-1} = (x - 4)^2$ for $x \geq 0$

18. $y = 8x + 1$
    $f^{-1} = \frac{x - 1}{8}$

Homework Review…

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1. $4^{-3} = \frac{1}{64}$
   $\log_4 \frac{1}{64} = -3$

2. $5^{-2} = \frac{1}{25}$
   $\log_5 \frac{1}{25} = -2$

3. $8^{-1} = \frac{1}{8}$
   $\log_8 \frac{1}{8} = -1$

4. $11^0 = 1$
   $\log_{11} 1 = 0$

5. $6^1 = 6$
   $\log_6 6 = 1$

6. $6^{-3} = \frac{1}{216}$
   $\log_6 \frac{1}{216} = -3$

7. $17^0 = 1$
   $\log_{17} 1 = 0$

8. $17^1 = 17$
   $\log_{17} 17 = 1$

Homework Review…

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9. $3 = \log_2 8$ $2^3 = 8$

10. $2 = \log_5 25$ $5^2 = 25$

11. $\log 0.1 = -1$ $10^{-1} = 0.1$

12. $\log 7 \approx 0.845$ $10^{0.845} \approx 7$

13. $\log 1000 = 3$ $10^3 = 1000$

14. $-2 = \log 0.01$ $10^{-2} = 0.01$

15. $\log_3 81 = 4$ $3^4 = 81$

16. $\log_{49} 7 = \frac{1}{2}$ $49^{\frac{1}{2}} = 7$

17. $\log_8 \frac{1}{4} = -\frac{2}{3}$ $8^{-\frac{2}{3}} = \frac{1}{4}$

18. $\log_2 128 = 7$ $2^7 = 128$

19. $\log_5 \frac{1}{625} = -4$ $5^{-4} = \frac{1}{625}$

20. $\log_6 36 = 2$ $6^2 = 36$

Homework Review…

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21. $\log_2 64$ 6

22. $\log_4 64$ 3

23. $\log_3 3^4$ 4

24. $\log 10$ 1

25. $\log 0.1$ -1

26. $\log 1$ 0

27. $\log_8 2$ $\frac{1}{3}$

28. $\log_{32} 2$ $\frac{1}{5}$

29. $\log_9 3$ $\frac{1}{2}$

Objectives

Define the relationship between logarithms and exponential functions.

Convert logarithmic expressions to exponential form and vice versa.

Evaluate logarithmic and exponential expressions.

Homework

Packet Page 14, 24-27 and 49-54
Packet Page 16, 1-12
Packet Page 17, 1-30 even

Things you should know about logarithms…

Logarithms are exponents

$$b^x = y \leftrightarrow log_b y = x$$

For example…

$$3^4 = 81 \leftrightarrow log_3 81 = 4$$

The log function returns the exponent, 4.

Can you find the unknown?

Hint: rewrite the expression in exponential form.

$\log_x 25 = 2$ $\quad x^2 = 25 \quad x = 5$

$\log_6 x = 2$ $\quad 6^2 = x \quad x = 36$

$\log_8 64 = x$ $\quad 8^x = 64 \quad x = 2$

When you are asked to evaluate a log, simply set it equal to a variable, x. Then use the previous procedures to solve. (Put in exponential form.)

$\log_4 16$	$log_4 16 = x$	$4^x = 16$	$x = 2$
$\log_{12} 12$	$log_{12} 12 = x$	$12^x = 12$	$x = 1$
$\log_9 1$	$log_9 1 = x$	$9^x = 1$	$x = 0$

Properties of Exponents	For all nonzero real numbers x and y and integers m and n.	Algebra	Numbers
Product of Powers Property	To multiply powers with the same base, add the exponents.	$x^m \cdot x^n = x^{m+n}$	$4^3 \cdot 4^2 = 4^{3+2} = 4^5$
Quotient of Powers Property	To divide powers with the same base, subtract the exponents.	$\frac{x^m}{x^n} = x^{m-n}$	$\frac{3^7}{3^2} = 3^{7-2} = 3^5$
Power of a Power Property	To raise one power to another, multiply the exponents.	$(x^m)^n = x^{m \cdot n}$	$(4^3)^2 = 4^{3 \cdot 2} = 4^6$
Power of a Product Property	To find the power of a product, apply the exponent to each factor.	$(xy)^m = x^m y^m$	$(3 \cdot 4)^2 = 3^2 \cdot 4^2$
Power of a Quotient Propterty	To find the power of a quotient, apply the exponent to the numerator and denominator.	$\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$	$\left(\frac{3}{5}\right)^2 = \frac{3^2}{5^2}$
Negative Exponent Property	A nonzero base raised to the negative exponent is equal to the reciprocal of the base raised to the positive exponent.	$x^{-n} = \left(\frac{1}{x}\right)^n$ $\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$	$7^{-2} = \left(\frac{1}{7}\right)^2$ $\left(\frac{3}{2}\right)^{-4} = \left(\frac{2}{3}\right)^4$
Identity Exponent Property	A nonzero quantity raised to the first power is equal to itself.	$x^1 = x$	$8^1 = 8$
Zero Exponent Property	A nonzero quantity raised to the zero power is equal to 1.	$x^0 = 1$	$125^0 = 1$

Let's review some properties of exponents

Remember that logs are exponents so they have similar properties…

Exponent Property	Log Property	Example
$x^0 = 1$	$log_x 1 = 0$	$log_4 1 = 0$
$x^1 = x$	$log_x x = 1$	$log_7 7 = 1$
$x^n = x^n$	$log_x x^n = n$	$log_2 2^9 = 9$

Algebraic Properties of Logarithms

Expand Log Expressions

$$\log_b(xy) = \log_b x + \log_b y$$

$$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$$

$$\log_b x^n = n \log_b x$$

Compress Log Expressions

How are these properties similar to the rules for exponents?

Expand the following

$$log_3(9xy^2) = log_3 9 + log_3 x + log_3 y^2$$

$$= log_3 9 + log_3 x + 2log_3 y$$

$$= 2 + log_3 x + 2log_3 y$$

Expand the following

$$log_4\left(\frac{x}{16y}\right) = log_4 x - log_4 25y$$
$$= log_4 x - (log_4 16 + log_4 y)$$
$$= log_4 x - (2 + log_4 y)$$
$$= log_4 x - 2 - log_4 y$$

Expand the following

$$log\left(\frac{100x^2}{y^3}\right) = \log 100x^2 - \log y^3$$
$$= \log 100 + \log x^2 - \log y^3$$
$$= 2 + 2\log x - 3\log y$$

IMPORTANT NOTE

If **log** is written without a base, it's the common log which has a base of 10.

$$\log 1000 = log_{10}1000 = 3$$

Now let's go the other way. Write the following expression as a single logarithm.

$$2log_3 x + 3log_3 y - log_3 z$$

$$= log_3\, x^2 + log_3 y^3 - log_3 z$$

$$= log_3\, x^2 y^3 - log_3 z$$

$$= log_3 \left(\frac{x^2 y^3}{z}\right)$$

Write following expression as one log statement

$$1 + log_4 x - \frac{1}{2} log_4 y = log_4 4 + log_4 x - log_4 y^{\frac{1}{2}}$$

$$= log_4 4x - log_4 y^{\frac{1}{2}}$$

$$= log_4 \frac{4x}{y^{\frac{1}{2}}}$$

$$= log_4 \frac{4x}{\sqrt{y}}$$

Work on your homework problems.