

WARM UP - Calculator

1) If you invest \$4500 in an account that earns 3.2% per year, how much will you have in the account after 15 years?

$$y = 4500(1.032)^{15} = 7217.85 \quad | + 3.2\%$$

2) The population of a small town in Colorado is 8320 and is growing at a rate of 2.4% per year. What is the predicted population in 6 years?

$$y = 8320(1.024)^6$$

Evaluate each. **No calculator.**

3) $\log_{25} 125$

$$\begin{aligned} 25^x &= 125 \\ 5^{2x} &= 5^3 \rightarrow 2x=3 \\ x &= \frac{3}{2} \end{aligned}$$

4) $\log_{100} 10 = x$

$$\begin{aligned} 100^x &= 10 \\ 10^{2x} &= 10^1 \rightarrow 2x=1 \\ x &= \frac{1}{2} \end{aligned}$$

No calculator.

7) GRAPH:

$$y = \log_3(x - 4)$$

State the asymptote.

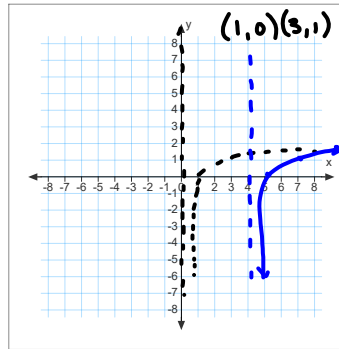
5) $\log_3 \frac{1}{27} = x$

$$\begin{aligned} 3^x &= \frac{1}{27} \\ 3^x &= 3^{-3} \\ x &= -3 \end{aligned}$$

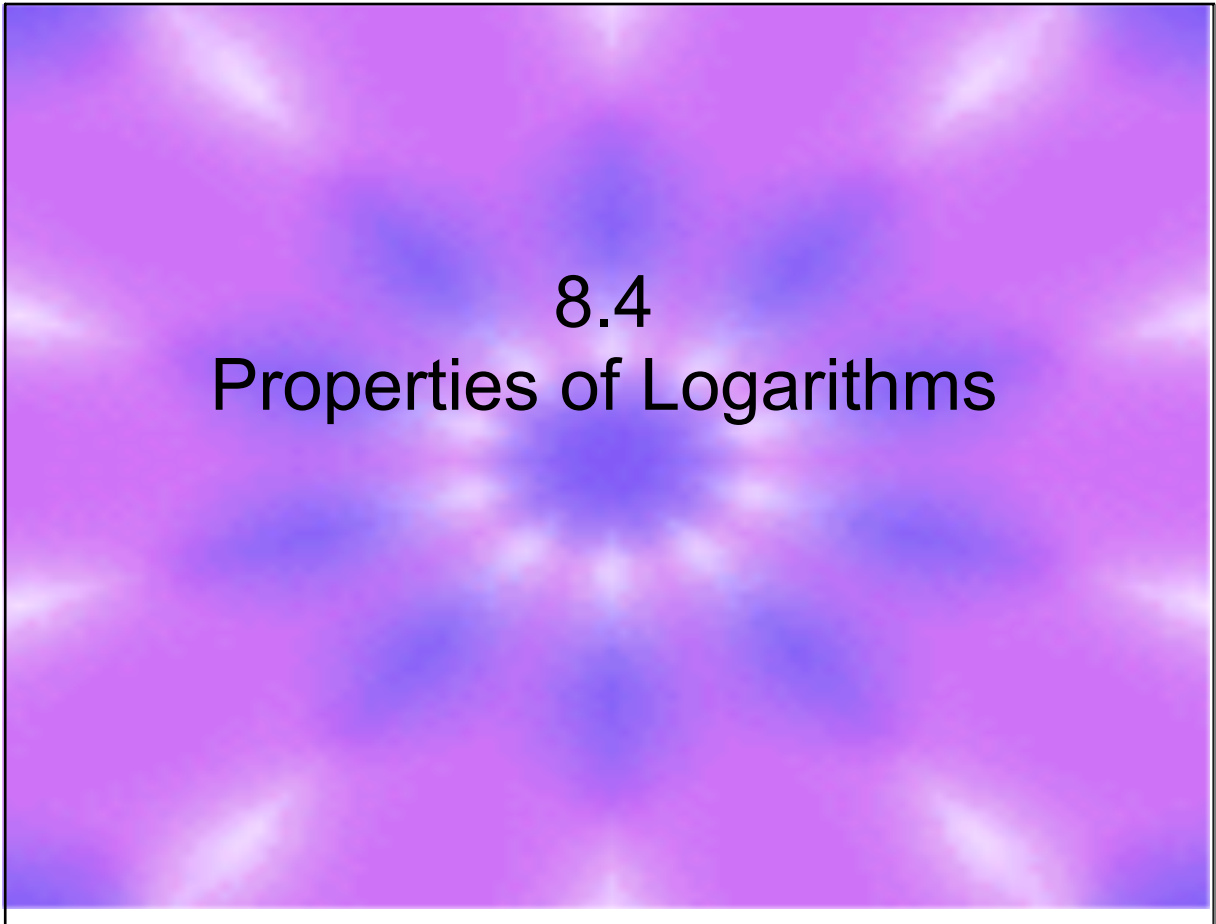
6) $\log_{16} 1 = x$

$$\begin{aligned} 16^x &= 1 \\ x &= 0 \end{aligned}$$

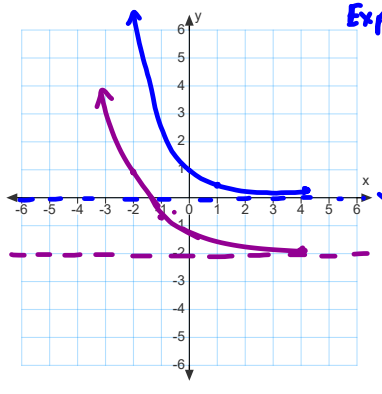
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Feb 28-11:49 AM



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Exp (0,1)(1, 1/2)

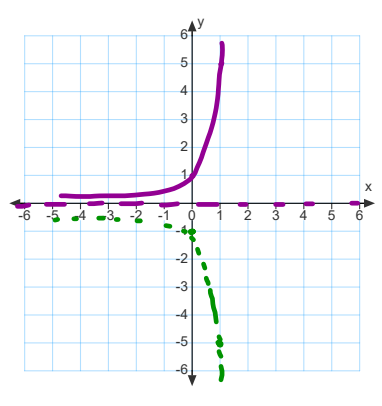
$y = 3 \left(\frac{1}{2}\right)^x - 2$

(0,1) (1, 1/2)

$y = 3 (0,3) (1, 3)$

$x = 2 (-2, 3) (-1, 3/2)$

$y = 2 (-2, 1) (-1, 1/2)$



$y = -5x^{-2} + 3$ right 2

(0,1) (1,5)

$y = -1 (0,1) (1, -5)$ up 3

PROPERTY	EXAMPLE(S)	RULE	Verify with Calculator
R.P. $\Rightarrow (1, 0)$ Foundations	$\log_3 1 = 0$ $\log_7 1 = 0$	$\log_b 1 = 0$	✓
	R.P. $\Rightarrow (b, 1)$ $\log_2 2 = 1$	$\log_b b = 1$	✓
Product	$\log_3 (8) = \log_3 2 + \log_3 4$	$\log_b (MN) = \log_b M + \log_b N$	✓
Quotient	$\log \frac{2}{3} = \log 2 - \log 3$	*Based on the Product Property, can you determine what this equals? $\log_b \frac{M}{N} = \log_b M - \log_b N$	✓
Power	$\log 5^2 = 2 \log 5$	$\log_b M^N = N \log_b M$	✓
One-to-One	$\log_2 x = \log_2 5$ then $x = 5$	$\log_b M = \log_b N$ $M = N$	✓
Change of Base	$\log_2 8 = \frac{\log 8}{\log 2}$	$\log_b a = \frac{\log_n a}{\log_n b}$	✓

$\log_2 2 = x$

$2^x = 2$

$x = 1$

8.4 Properties of Logarithms

Let all variables be positive numbers, and $b \neq 1$.

- Product property:

$$\log_b MN = \log_b M + \log_b N$$

$$x^2 \cdot x^3 = x^{2+3} = x^5$$

- Quotient property:

$$\log_b \frac{M}{N} = \log_b M - \log_b N$$

$$\frac{x^4}{x^{10}} = \frac{1}{x^{10-4}} = \frac{1}{x^6} = x^{-6}$$

- Power property:

$$\log_b M^x = x \log_b M$$

$$\log_b m^x = \underbrace{\log_b m + \log_b m + \log_b m \dots \dots}_x \times \log_b m$$

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Expanding Logarithms

You can use the properties to expand logarithms.

$$\log_2 \frac{7x^3}{y^2}$$

$$\log_2(7x^3) - \log_2(y^2) \quad \text{product rule}$$

$$\log_2 7 + \log_2 x^3 - \log_2 y^2 \quad \text{quotient rule}$$

$$\log_2 7 + 3 \log_2 x - 2 \log_2 y \quad \text{exponent rule}$$

$$\log_2 \left(\frac{7x^3}{y} \right)^2$$

$$\log_2 \left(\frac{7^2 x^6}{y^2} \right)$$

$$\log_2 7^2 + \log_2 x^6 - \log_2 y^2$$

$$2 \log_2 7 + 6 \log_2 x - 2 \log_2 y$$

Mar 1-2:31 PM

Your turn:

1) Expand: $\log 5\sqrt{3a} =$

$$\log 5(3a)^{\frac{1}{2}}$$

$$\log 5(3)^{\frac{1}{2}}a^{\frac{1}{2}}$$

$$\log 5 + \log 3^{\frac{1}{2}} + \log a^{\frac{1}{2}}$$

$$\log 5 + \frac{1}{2}\log 3 + \frac{1}{2}\log a$$



$$\log 5 + \frac{1}{2}(\log 3 + \log a)$$

2) Expand: $\log_8 8x^3 =$

$$\log_8 8 + \log_8 x^3$$

$$1 + 3\log_8 x$$



$$1 + 3\log_8 x$$

Mar 1-2:32 PM

Write as a single log. (Condensing)

Example:

need to have same base

$$\log 6 + 2\log 2 - \log 3 =$$

$$\log 6 + \log 2^2 - \log 3$$

$$\log \frac{6 \cdot 4}{3}$$

$$\log 8$$

Mar 1-2:29 PM

Your turn! Write as a single log (condense)

$$3) \log_5 7 + 3 \log_5 t =$$

$$\log_5 7 + \log_5 t^3$$

$$\log_5 (7t^3)$$



$$\log_5 7t^3$$

$$4) 3\log_2 x - (\log_2 4 + \log_2 y) =$$

$$3\log_2 x - \log_2 4 - \log_2 y$$

$$\log_2 x^3 - \log_2 4 - \log_2 y$$

$$\log_2 \frac{x^3}{4y}$$



$$\log_2 \frac{x^3}{4y}$$

Mar 1-2:30 PM



GO COUGARS!

HW - Google Math Lib located in the google classroom. Be sure to write the sentence at the bottom of the form.

Aug 29-11:17 AM