Algebra II: 7.5 Notes
Date:

Name:
Period:

Objective: Rewrite logarithmic functions.

KEY CONCEPT

Properties of Logarithms

Let b, m, and n be positive numbers such that $b \neq 1$.

Product Property (×)	$\log_b mn = \log_b m + \log_b n$
Quotient Property (÷)	$\log_b \frac{m}{n} = \log_b m - \log_b n$
Power Property (n)	$\log_b m^n = n \log_b m$

CHANGE-OF-BASE FORMULA Logarithms with any base other than 10 or e can be written in terms of common or natural logarithms using the *change-of-base formula*. This allows you to evaluate any logarithm using a calculator.

KEY CONCEPT

Change-of-Base Formula

If a, b, and c are positive numbers with $b \neq 1$ and $c \neq 1$, then:

$$\log_c a = \frac{\log_b a}{\log_b c}$$

In particular, $\log_c a = \frac{\log a}{\log c}$ and $\log_c a = \frac{\ln a}{\ln c}$.

Use $\log_4 3 \approx 0.792$ and $\log_4 7 \approx 1.404$

1. $\log_4 \frac{3}{7} = \log_4 3 - \log_4 7$
$= 0.792 - 1.404$
$= -0.612$

2. $\log_4 21 = \log_4 7(3)$
$= \log_4 7 + \log_4 3$
$= 1.404 + 0.792$
$= 2.196$

3. $\log_4 49$
$= \log_4 7^2$
$= 2 \log_4 7$
$= 2(1.404)$
$= 2.808$

4. $\log_4 9$
$= \log_4 3^2$
$= 2 \log_4 3$
$= 2(0.792)$
$= 1.584$

Expand.

5. $\log_6 \frac{5x^3}{y}$

$= \log_6 5x^3 - \log_6 y$

$= \log_6 5 + \log_6 x^3 - \log_6 y$

$= \log_6 5 + 3\log_6 x - \log_6 y$

6. $\log 3x^4$

$= \log 3 + \log x^4$

$= \log 3 + 4\log x$

Condense

7. $\log 9 + 3\log 2 - \log 3$

$= \log 9 + \log 2^3 - \log 3$

$= \log 9 \cdot 2^3 - \log 3$

$= \log \frac{9 \cdot 2^3}{3} = \log \frac{72}{3} = \log 24$

8. $\ln 4 + 3\ln 3 - \ln 12$

$= \ln 4 + \ln 3^3 - \ln 12$

$= \ln 4(3^3) - \ln 12$

$= \ln \frac{4(3^3)}{12} = \ln \frac{108}{12}$

$= \ln 9$

Use the change of base formula to evaluate the logarithm.

9. $\log_3 8$

$= \frac{\log 8}{\log 3}$

≈ 1.893

10. $\log_5 8$

$= \frac{\ln 8}{\ln 5}$

≈ 1.292

11. $\log_8 14$

$= \frac{\log 14}{\log 8}$

≈ 1.269

12. $\log_{26} 9$

$= \frac{\ln 9}{\ln 26}$

≈ 0.674