

### Properties of Logarithms

Simplify and evaluate the following expressions by using properties of logarithms

1.  $\log_2 2^3 = \boxed{3}$

2.  $3^{\log_3 5}$

3.  $e^{\ln 2} = \boxed{2}$

4.  $\log 2 + \log 5$

5.  $\log_6 2 + \log_6 3 = \log_6 (2 \cdot 3) = \log_6 (6) = \boxed{1}$

Write each expression as a sum and/or difference of logarithms. Write exponents as coefficients.

6.  $\log ab$

7.  $\log_2 (xy^2)$   
 $\log_2 (x) + \log_2 (y^2)$

8.  $\log_7 \left( \frac{49}{7} \right)$

$\log_2 x + 2 \cdot \log_2 y$

9.  $\log_5 (x^2 \sqrt{y^2 + 1})$   
 $\log_5 x^2 + \log_5 (y^2 + 1)^{1/2}$

10.  $\log \left( \frac{x^4}{\sqrt[3]{(x-1)}} \right)$

$2 \log_5 x + \frac{1}{2} \log_5 (y^2 + 1)$

Write each expression as a single logarithm

11.  $\log 25 + \log 4$   
 $\log (25 \cdot 4) = \boxed{\log (100)}$

12.  $\log_4 3 - \log_4 x$

13.  $\frac{1}{2} \log_3 x + 3 \log_3 (x-1)$

14.  $\log_8 (x^2 - 1) - \log_8 (x + 1)$

$\log_3 x^{1/2} + \log_3 (x-1)^3$

$\log_3 (\sqrt{x} (x-1)^3)$



$$15. (18 \log x + 9 \log y) - \log 10$$

Use the Change-of-Base to write the following in only common logarithms. Then use your calculator to evaluate each.  <sup>$\log x$</sup>   
(2 decimal places)

$$16. \log_2 10$$

$$17. \log_8 3$$

$$18. \log_{\frac{1}{3}} 19$$

$$19. \log_{\frac{1}{4}} 3$$

$$\frac{\log(10)}{\log(2)} = \boxed{3.32}$$

$$\frac{\log(19)}{\log(\frac{1}{3})} = \boxed{-2.68}$$

#### Review

Determine how many terms in the series and then find the sum

$$1. \quad 3, 6, 12, \dots, 12288$$

$$2. \quad 5, 15, 45, \dots, 98415$$