

6.1 PROPERTIES OF LOGARITHMS

Expand each logarithm.

1. $\log_8 4ab^2$

$$\log_8 4 + \log_8 a + 2\log_8 b$$

2. $\log_2 (cd)^3$

$$3\log_2 c + 3\log_2 d$$

3. $\log_3 \frac{7}{v^3}$

$$\log_3 7 - 3\log_3 v$$

4. $\log \frac{w^5 x}{yz^9}$

$$5\log w + \log x - \log y - 9\log z$$

Condense each expression into a single logarithm.

5. $\log 3 - \log 8$

$$\log \left(\frac{3}{8} \right)$$

6. $3\log_4 x + \log_4 y$

$$\log_4 x^3 y$$

7. $\log_5 2 + 6\log_5 k - 3\log_5 m$

$$\log_5 \left(\frac{2k^6}{m^3} \right)$$

8. $5\log_3 x \cdot \log_3 y$

$$\log_3 x^5 \cdot \log_3 y$$

9. $4(\log_3 a + \log_3 b)$

$$\log_3 (ab)^4$$

10. $2(\log_9 2 + \log_9 x) - 3(\log_9 3 + \log_9 y)$

$$\boxed{\log_9 \frac{(2x)^2}{(3y)^3}} = \log_9 \frac{4x^2}{27y^3}$$

Rewrite each equation in logarithmic form.

11. $3^5 = 243$

$$\log_3 243 = 5$$

12. $81 = 243^{\frac{4}{5}}$

$$\log_{243} 81 = \frac{4}{5}$$

Rewrite each equation in exponential form.

13. $\log_2 8 = 3$

$$2^3 = 8$$

14. $\log_{243} 27 = \frac{3}{5}$

$$243^{\frac{3}{5}} = 27$$

Evaluate each logarithm.

15. $\log_5 125 = y$ $5^y = 125$ $\boxed{y = 3}$

16. $\log_{12} 12 = \boxed{1}$

17. $\log 10^{-2} = \log_{10} 10^{-2} = \boxed{-2}$

18. $\log_7 7^8 = \boxed{8}$

19. $\log_{16} 1 = \boxed{0}$

20. $\log 2 = \log_{10} 2 \approx \boxed{0.301}$

21. $6^{\log_6 7} = \boxed{7}$

22. $\log_6 52 = \frac{\log 52}{\log 6} \approx \boxed{2.205}$