

Section 5.3: Properties of Logarithms

Exercises

State whether the following equations are T (true) or F (false) for all possible values of the variables. You'll note that some of these are indeed the properties of logs. However, some only **look** like the properties of logs, but unfortunately are incorrect.

1. $\log(M + N) = \log M + \log N$
2. $\log(MN) = (\log M)(\log N)$
3. $\log(MN) = \log M + \log N$
4. $n \log x = \log(nx)$
5. $\frac{\log M}{\log N} = \log\left(\frac{M}{N}\right)$
6. $\frac{\log M}{\log N} = \frac{M}{N}$ (logs cancel)
7. $\frac{\log M}{\log N} = \log_N M$
8. $n \log x = \log(x^n)$

Write each expression as a single logarithm and simplify.

9. $\log 2000 - \log 2$
10. $\log 2 + \log 5$
11. $\log_2 4x - \log_2 x$
12. $\log_3 5 + \log_3 2$
13. $\log_5 x - \log_5 y + \log_5 z$
14. $\log_a a^3 - 2 \log_a a$

Write each expression in terms of $\log 2$ and/or $\log x$.

15. $\log 2x$

$$16. \log\left(\frac{x}{4}\right)$$

$$17. \log(8x^3)$$

$$18. \log\sqrt{x}$$

$$19. \log\left(\frac{1}{x}\right)$$

$$20. \log(2x)^7$$

Rewrite each expression as a single logarithm and simplify.

$$21. 2\log x - 3\log y$$

$$22. \frac{1}{3}\log x + 5\log 2$$

$$23. 2\log 3 - 3\log y$$

$$24. \log 5 + 3\log 2 - \log 4$$

$$25. \frac{1}{2}\log 4 + \frac{1}{3}\log 27$$

$$26. 2\log x + 3\log x^2$$

Use the base-change formula to find each logarithm to four decimal places

$$27. \log_7 10$$

$$28. \log_{0.2} 15$$

$$29. \log_{1.05} 2$$

$$30. \log_2 1.05$$

$$31. \log_{500} 1000$$

$$32. \log_{0.001} 10$$