

11.4 Laws of Logarithm Worksheet

Write each equation in logarithmic form.

1. $2^5 = 32$ $\log_2 32 = 5$

2. $5^{-3} = \frac{1}{125}$ $\log_5 \frac{1}{125} = -3$

3. $6^{-3} = \frac{1}{216}$ $\log_6 \frac{1}{216} = -3$

Write each equation in exponential form.

4. $\log_3 27 = 3$ $3^3 = 27$

5. $\log_4 16 = 2$ $4^2 = 16$

6. $\log_{100} \frac{1}{10} = -2$ $10^{-2} = \frac{1}{100}$
 ↑
 common logarithm

Evaluate each expression without a calculator.

7. $\log_7 7^3 = 3$

8. $\log 0.001 = -3$

9. $3^{\log_3 6} = 6$

10. $4^{2 \log_4 5} = 25$

11. $\log_5 1 = 0$

12. $\log_6 4 + 2 \log_6 3 = 2$

13. $\frac{1}{2} \log_3 144 - 2 \log_3 6 = -1$
 $\log_3 \frac{12}{36}$

14. $\frac{1}{2} \log_5 16 - 2 \log_5 10 = -2$
 $\log_5 \frac{4}{100}$

15. $\frac{1}{3} (\log_2 12 + \log_2 16 - \log_2 3) = 2$
 $\log_2 64^{1/3}$

Solve each equation.

16. $\log_2 24 - \log_2 2 = \log_2 x = 12$

17. $3 \log_5 2 = \log_5 x = 8$

18. $\log_6 x - \log_6 5 = \log_6 4 = 20$

19. $\log x = \frac{1}{3} \log 8 + \frac{1}{2} \log 81 = 18$

20. $\log_3 x^2 = \log_3 8 + \log_3 10 - \log_3 5 = \pm 4$

21. $\log_3 x - \log_3 4 = 2 \log_3 5 = 100$

22. $\frac{1}{2} \log_7 x = \log_7 20 - 2(\log_7 2 + \log_7 5) = \frac{1}{25}$

23. $\log_6 5 + 2 \log_6 x = \log_6 45 = 3$
 -3 doesn't work

24. $\log_5 x = 3 \log_5 4 - \frac{1}{3} \log_5 64 = 16$

25. $\log_5 x + \log_5(x+1) = \log_5 20 = 4$
 -5 doesn't work

26. $\log_4(x-3) + \log_4(x+3) = 2 = 5$
 -5 doesn't work

27. $\log_5(x+1) - \log_5(x-1) = 2 = 13/12$

28. $\log x + \log(x-3) = 1 = -5$
 $x^2 - 3x = 10$
 -2 doesn't work

29. $\log_9((x-5) + \log_9(x+3)) = 1 = 6$
 -4 doesn't work

Graph each equation.

30. $y = \log_3 x$

31. $y = \log_3(x) + 1$

32. $y = \log_3(x+1)$

