

Name _____ Date _____ Per _____

Fill in the blanks in problems 1-9.

1. $\log_a 1 = \underline{\hspace{2cm}}$ 2. $\log_a a = \underline{\hspace{2cm}}$ 3. $a^{\log_a M} = \underline{\hspace{2cm}}$

4. $\log_a a^r = \underline{\hspace{2cm}}$ 5. $\log_a (MN) = \underline{\hspace{4cm}}$

6. $\log_a M - \log_a N = \underline{\hspace{4cm}}$ 7. $r \log_a M = \underline{\hspace{4cm}}$

8. If $\log_a x = \log_a 6$, then $x = \underline{\hspace{2cm}}$ 9. If $\log_8 M = \frac{\log_5 7}{\log_5 8}$, then $M = \underline{\hspace{2cm}}$

True or False. If false, explain what is wrong with the statement using at least one whole complete sentence. Yes, a whole sentence. Gasp! The horror! – “Please, don’t inflict such torment on us!” – *Evil laugh*
Then fix the mistake.

10. $\log_2(3x^4) = 4\log_2(3x)$

11. $\ln(x+3) - \ln(2x) = \frac{\ln(x+3)}{\ln(2x)}$

12. $\log \sqrt{x} = \log x^{1/2} = \frac{\log x}{2}$

Use the properties of logarithms to find the exact value of each expression. Do not use a calculator.

13. $\log_3 3^{71}$

14. $\ln e^{\sqrt{2}}$

15. $2^{\log_2 7}$

16. $10^{\log 0.5}$

17. $\log_5 100 - \log_5 4$

18. $\log_6 9 + \log_6 4$

19. $\log_2 6 \cdot \log_6 8$

20. $3^{\log_3 12 - \log_3 2}$

In problems 21-24, suppose that $a = \ln 2$ and $b = \ln 3$. Use the properties of logarithms to write each logarithm in terms of a and/or b .

Example: $\ln 1.5$: $\ln 1.5 = \ln \frac{3}{2} = \ln 3 - \ln 2 = \boxed{b - a}$

21. $\ln 6$

22. $\ln \frac{2}{3}$

23. $\ln 8$ (Hint: Use an exponent)

24. $\ln 0.5$ (Hint: Use a 1 – You know what $\ln 1$ is)

Use the Change-of-Base Formula, write it down, and a calculator to evaluate each logarithm. Round your answer to three decimal places.

25. $\log_3 21$

26. $\log_{1/3} 71$

27. $\log_{25} 4$

28. $\log_\pi e$

Write each expression as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

29. $\log_5 (25x^3yz^4)$

30. $\ln(ex)$

31. $\ln\left(\frac{x}{e^x}\right)$

32. $\log_6 \sqrt{xy^5z}$

33. $\log_4 \frac{x}{y^3}$

34. $\log_7 \frac{a^5b^3}{cd^8}$

35. $\log_9 (u^3v)^3$

36. $\log \left[\frac{x(x+2)}{(x+3)^2} \right]$

37. $\ln \left[\frac{x^2 - x - 2}{(x+4)^2} \right]^{1/3}$

38. $\log_5 \left(\frac{\sqrt[3]{x^2+1}}{x-1} \right)$

Write each expression as a single logarithm.

39. $5\log_6 x + 7\log_6 y$

40. $2\log_3 m - \log_3 n$

41. $\log_2 x^3 - \log_2 \sqrt{x}$

42. $\frac{\log_4 x}{3}$

43. $\log_7 z + \log_7 x - 2\log_7 y$

44. $4\log_3 k - 5\log_3 m + \log_3 n - 2\log_3 p$

45. $\log(x^2 + 3x + 2) - 2\log(x + 1)$

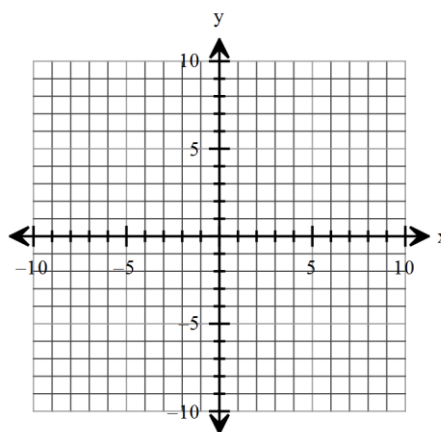
46. $\ln\left(\frac{x}{x-1}\right) + \ln\left(\frac{x+1}{x}\right) - \ln(x^2 - 1)$

47. $2\log_a(5x^3) - \frac{1}{2}\log_a(2x+3)$

48. $3\log_5(x+1) - \log_5(x+3) - \log_5(x-1)$

Graph the function using a graphing calculator and the Change-of-Base Formula.

49. $f(x) = \log_5 x$



Use the properties of logarithms to express y as a function of x . The constant C is a positive number.

50. $\ln y = \ln x + \ln C$

51. $\ln y = \ln x + \ln(x+1) + \ln C$