

Name _____ Date _____ Period _____

1. $\log_a 1 =$ _____ 2. $\log_a a =$ _____ 3. $a^{\log_a M} =$ _____

4. $\log_a a^r =$ _____ 5. $\log_a(MN) =$ _____ 6. $\log_a\left(\frac{M}{N}\right) =$ _____

7. $\log_a M^r =$ _____ 8. If $\log_a x = \log_a 6$, then $x =$ _____.

9. If $\log_8 M = \frac{\log_5 7}{\log_5 8}$, then $M =$ _____.

10. True or False: $\frac{\ln 8}{\ln 2} = 3$

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

12. True or False: $\log_2(3x^4) = 4\log_2(3x)$

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

13. $\log_2 2^{-13}$

14. $2^{\log_2 7}$

15. $\log_4 4$

16. $\ln \sqrt[4]{e}$

17. $e^{\ln 6}$

18. $\log_6 1$

19. $7^{\log_7 6}$

20. $\log 10,000$

21. $10^{\log(0.5)}$

22. $\log_5 \sqrt[3]{25}$

23. $\log_6 \frac{1}{\sqrt[3]{36}}$

24. $\ln \frac{1}{e}$

25. $\log 10^{-4}$

26. $\log \sqrt[3]{10}$

27. $e^{\ln\left(\frac{1}{5}\right)}$

28. $\ln e^3$

29. $10^{\log 14}$

30. $\ln e$

31. $10^{\log(5)}$

32. $\log_2 32$

33. $\ln 1$

34. $\log_7 1$

35. $\ln \frac{1}{\sqrt{e^7}}$

Assuming x and y are positive, use properties of logarithms to write the expression as a sum and/or difference of logarithms or multiples of logarithms. Express exponents as factors using the power property. Simplify if possible.

36. $\ln 4x$

37. $\log \frac{5}{y}$

38. $\log y^4$

39. $\log_6 x^2 y^3$

40. $\ln \frac{x^3}{y^2}$

41. $\log_3 x^{-2}$

42. $\ln(ex)$

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

44. $\ln(\sqrt{1-x})$

Assuming x , y and z are positive, use properties of logarithms to write the expression as a single logarithm. Simplify if possible.

45. $\log y + \log 7$

46. $\ln y - \ln x$

47. $\frac{1}{2} \ln y$

48. $3 \log(xy) - 2 \log(yz)$

49. $2 \ln x^2 y + 3 \ln xy^3$

50. $3 \log_5 u + 4 \log_5 v$

51. $2 \log_3 u - \log_3 v$

52. $\log(2x - 3) + \log(7x + 6)$

Use the Change-of-Base Formula and a calculator to evaluate each logarithm. Round your answer to three decimal places. You must write the Change-of-Base expression.

53. $\log_3 21$

54. $\log_5 18$

55. $\log_6 2$

Suppose that $\ln 2 = a$ and $\ln 3 = b$, use the properties of logarithms to write each logarithm in terms of a and b .

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

57. $\ln \frac{1}{2}$

58. $\ln 2^3$

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

59. $\log_8 2 + \log_8 4$

60. $\log_6 18 - \log_6 3$

61. $3^{\log_3 5 - \log_3 4}$

62. The value of a Honda Civic DX that is t years old can be modeled by $V(t) = 16,775(0.905)^t$. According to the model, when will the car be worth \$15,000? \$8,000? \$4,000? Show work! Round to the nearest hundredth.