9.6

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(\dfrac{M}{N}\right) = $ _____

7. $\log_a M^r = $ _____

8. If $\log_a x = \log_a 6$, then $x = $ _____ .

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

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

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

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

Use properties of logarithms of 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. $\log_6 \dfrac{1}{\sqrt[3]{36}}$

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

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. $\ln \dfrac{1}{\sqrt{e^7}}$

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. $\log \dfrac{5}{y}$

38. $\log y^4$

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

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

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

42. $\ln(ex)$

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

44. $\log_a\left(u^2 v^3\right)$

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. $\dfrac{1}{2}\ln y$

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

49. $3\log_5 u + 4\log_5 v$

50. $2\log_3 u - \log_3 v$

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

51. $\log_3 21$

52. $\log_5 18$

53. $\log_2 15$

54. $\log_6 4$