Honors Algebra 3-4
Exponent / Logarithms Worksheet 1

Name Key

Period

Write each equation in exponential form:

#1. $\log_4 64 = 3$ $4^3 = 64$

#2. $\log_3 81 = 4$ $3^4 = 81$

#3. $\log_7 \frac{1}{49} = -2$ $7^{-2} = \frac{1}{49}$

#4. $\log_{10} \frac{1}{1000} = -3$ $10^{-3} = \frac{1}{1000}$

#5. $\log_{32} 4 = \frac{2}{5}$ $32^{2/5} = 4$

#6. $\log_{16} 8 = \frac{3}{4}$ $16^{3/4} = 8$

#7. $\ln 1 = 0$ $e^0 = 1$

#8. $\ln 4 = 1.386....$ $e^{1.386\ldots} = 4$

Write each equation in logarithmic form:

#9. $5^3 = 125$ $\log_5 125 = 3$

#10. $8^2 = 64$ $\log_8 64 = 2$

#11. $81^{\frac{1}{4}} = 3$ $\log_{81} 3 = \frac{1}{4}$

#12. $9^{\frac{3}{2}} = 27$ $\log_9 27 = \frac{3}{2}$

#13. $6^{-2} = \frac{1}{36}$ $\log_6 \frac{1}{36} = -2$

#14. $10^{-3} = 0.001$ $\log_{10} 0.001 = -3$

#15. $e^3 = 20.0855...$ $\ln 20.0855... = 3$

#16. $e^x = 4$ $\ln 4 = x$

Evaluate each expression without using a calculator:

#17. $\log_2 16$ $2^x = 16$ $\boxed{4}$

#18. $\log_{27} 9$ $27^x = 9$ $27^{2/3} = (27^{1/3})^2 = 9$ $\boxed{\frac{2}{3}}$

#19. $\log_{16}\left(\frac{1}{4}\right)$ $16^x = \frac{1}{4}$ $16^{-1/2} = \frac{1}{16^{1/2}}$ $\boxed{-\frac{1}{2}}$

#20. $\log_2\left(\frac{1}{8}\right)$ $2^x = \frac{1}{8}$ $\boxed{-3}$

#21. $\log_{10} 0.01$ $10^x = .01$ $\boxed{-2}$

#22. $\log_{10} 1000$ $10^x = 1000$ $\boxed{3}$

Solve each equation for x:

#23. $\log_7 x = \log_7 9$ $\boxed{x = 9}$

#24. $\log_5 5 = x$ $5^x = 5$ $\boxed{x = 1}$

#25. $\ln e^8 = x$ $\boxed{x = 8}$

#26. $\log_5 x = 2$ $5^2 = x$ $\boxed{x = 25}$

#27. $5^x = 125$ $\boxed{x = 3}$

#28. $e^x = 42$

$\ln(e^x) = \ln 42$

$x = \ln 42 \approx 3.7377$

Honors Algebra 3-4 Name key

Exponent / Logarithms Worksheet 2 Period _____

Evaluate using your calculator and the change of base formula (round to nearest 3 decimal places):

#1. $\log_3 7 = \frac{\ln 7}{\ln 3} = 1.771$

#2. $\log_7 4 = \frac{\ln 4}{\ln 7} = 0.712$

#3. $\log_{\left(\frac{1}{2}\right)} 4 = \frac{\ln 4}{\ln .5} = -2$

#4. $\log_{\left(\frac{1}{8}\right)} 64 = \frac{\ln 64}{\ln 1/8} = -2$

#5. $\log_9(0.8) = \frac{\ln .8}{\ln 9} = -0.102$

#6. $\log_{\left(\frac{1}{3}\right)}(0.015) = \frac{\ln 0.015}{\ln 1/3} = 3.823$

#7. $\log_{15} 1460 = \frac{\ln 1460}{\ln 15} = 2.691$

#8. $\log_{20} 135 = \frac{\ln 135}{\ln 20} = 1.637$

Rewrite the logarithm as a multiple (fraction) of (a) a common logarithm (b) a natural logarithm.

#9. $\log_5 x = \frac{\log_{10} x}{\log_{10} 5} = \frac{\ln x}{\ln 5}$

#10. $\log_3 x = \frac{\log_{10} x}{\log_{10} 3} = \frac{\ln x}{\ln 3}$

#11. $\log_x\left(\frac{3}{10}\right) = \frac{\log_{10} 3/10}{\log_{10} x} = \frac{\ln 3/10}{\ln x}$

#12. $\log_x\left(\frac{3}{4}\right) = \frac{\log_{10} 3/4}{\log_{10} x} = \frac{\ln 3/4}{\ln x}$

#13. $\log_{2.6} x = \frac{\log_{10} x}{\log_{10} 2.6} = \frac{\ln x}{\ln 2.6}$

#14. $\log_{\left(\frac{1}{3}\right)} x = \frac{\log_{10} x}{\log_{10} 1/3} = \frac{\ln x}{\ln 1/3}$

Use the properties of logarithms to write the expression as a sum, difference, and/or constant multiple of logarithms (assume all variables are positive).

#15. $\log_{10} 5x = \log_{10} 5 + \log_{10} x$

#16. $\log_{10}\left(\frac{y}{2}\right) = \log_{10} y - \log_{10} 2$

#17. $\log_6 z^{-3} = -3 \log_6 z$

#18. $\ln \sqrt[3]{t} = \ln t^{1/3} = \frac{1}{3} \ln t$

#19. $\ln \frac{xy}{z} = \ln x + \ln y - \ln z$

#20. $\ln\left(\frac{x^2-1}{x^3}\right), \quad x>1$

$\ln(x^2-1) - \ln x^3$

$\ln(x^2-1) - 3\ln x$

$\ln[(x-1)(x+1)] - 3\ln x$

$\boxed{\ln(x-1) + \ln(x+1) - 3\ln x}$

Write the expression as the logarithm of a single quantity.

#21. $\ln y + \ln s = \ln(ys)$

#22. $\log_5 8 - \log_5 t = \log_5\left(\frac{8}{t}\right)$

#23. $3\ln x + 2\ln y - 4\ln z$

$\ln x^3 + \ln y^2 - \ln z^4 = \ln\left(\frac{x^3 y^2}{z^4}\right)$

#24. $\frac{5}{2}\log_7(z-4) = \log_7(z-4)^{5/2}$

#25. $4\left[\ln z + \ln(z+5)\right] - 2\ln(z-5)$

$4\ln z + 4\ln(z+5) - \ln(z-5)^2$

$\ln z^4 + \ln(z+5)^4 - \ln(z-5)^2 = \boxed{\ln\left(\frac{z^4(z+5)^4}{(z-5)^2}\right)}$

#26. $\frac{3}{2}\ln 5t^6 - \frac{3}{4}\ln t^4$

$\ln(5t^6)^{3/2} - \ln(t^4)^{3/4}$

$\ln 5^{3/2} t^9 - \ln t^3$

$\ln 5^{3/2} t^9 - \ln t^3$

$\ln (5^3)^{1/2} t^9 - \ln t^3$

$\ln \sqrt{125}\, t^6$

$\boxed{\ln 5\sqrt{5}\, t^6}$

Honors Algebra 3-4
Exponent / Logarithms Worksheet 1

Name_____
Period_____

Write each equation in exponential form:

#1. $\log_4 64 = 3$

#2. $\log_3 81 = 4$

#3. $\log_7 \frac{1}{49} = -2$

#4. $\log_{10} \frac{1}{1000} = -3$

#5. $\log_{32} 4 = \frac{2}{5}$

#6. $\log_{16} 8 = \frac{3}{4}$

#7. $\ln 1 = 0$

#8. $\ln 4 = 1.386....$

Write each equation in logarithmic form:

#9. $5^3 = 125$

#10. $8^2 = 64$

#11. $81^{\frac{1}{4}} = 3$

#12. $9^{\frac{3}{2}} = 27$

#13. $6^{-2} = \frac{1}{36}$

#14. $10^{-3} = 0.001$

#15. $e^3 = 20.0855...$

#16. $e^x = 4$

Evaluate each expression without using a calculator:

#17. $\log_2 16$

#18. $\log_{27} 9$

#19. $\log_{16}\left(\frac{1}{4}\right)$

#20. $\log_2\left(\frac{1}{8}\right)$

#21. $\log_{10} 0.01$

#22. $\log_{10} 1000$

Solve each equation for x:

#23. $\log_7 x = \log_7 9$

#24. $\log_5 5 = x$

#25. $\ln e^8 = x$

#26. $\log_5 x = 2$

#27. $5^x = 125$

#28. $e^x = 42$

Honors Algebra 3-4
Exponent / Logarithms Worksheet 2

Name_____
Period_____

Evaluate using your calculator and the change of base formula (round to nearest 3 decimal places):

#1. $\log_3 7$

#2. $\log_7 4$

#3. $\log_{\left(\frac{1}{2}\right)} 4$

#4. $\log_{\left(\frac{1}{8}\right)} 64$

#5. $\log_9 (0.8)$

#6. $\log_{\left(\frac{1}{3}\right)} (0.015)$

#7. $\log_{15} 1460$

#8. $\log_{20} 135$

Rewrite the logarithm as a multiple (fraction) of (a) a common logarithm (b) a natural logarithm.

#9. $\log_5 x$

#10. $\log_3 x$

#11. $\log_x \left(\frac{3}{10}\right)$

#12. $\log_x \left(\frac{3}{4}\right)$

#13. $\log_{2.6} x$

#14. $\log_{\left(\frac{1}{3}\right)} x$

Use the properties of logarithms to write the expression as a sum, difference, and/or constant multiple of logarithms (assume all variables are positive).

#15. $\log_{10} 5x$

#16. $\log_{10} \left(\frac{y}{2}\right)$

#17. $\log_6 z^{-3}$

#18. $\ln \sqrt[3]{t}$

#19. $\ln \frac{xy}{z}$

#20. $\ln \left(\frac{x^2 - 1}{x^3}\right), \quad x > 1$

Write the expression as the logarithm of a single quantity.

#21. $\ln y + \ln s$

#22. $\log_5 8 - \log_5 t$

#23. $3\ln x + 2\ln y - 4\ln z$

#24. $\frac{5}{2}\log_7 (z-4)$

#25. $4\left[\ln z + \ln (z+5)\right] - 2\ln (z-5)$

#26. $\frac{3}{2}\ln 5t^6 - \frac{3}{4}\ln t^4$