Honors Algebra 3-4 Name Key

Chapter 3 Review Worksheet Period ____

#1. Jill deposits $5000 into an investment in which the interest is compounded continuously. The balance will double in 12 years. $A = Pe^{rt}$

(a) What is the annual percentage rate for this investment? $2P = Pe^{r(12)}$, $2 = e^{r(12)}$, $\ln 2 = r(12)$, $r = \frac{\ln 2}{12}$, $r = .05776\ldots$, ≈ 5.82

(b) Find the balance after 30 years.

$A = 5000e^{(.05776\ldots)(30)}$

$A = \$28284.27$

#2. Evaluate $\log_b 18$, given that $\log_b 2 = 0.5298$ and $\log_b 3 = 0.8397$.

$\log_b 18$ → $0.5298 + 0.8397 + 0.8397$

$\log_b 2 \cdot 3 \cdot 3$

$\log_b 2 + \log_b 3 + \log_b 3$ → 2.2092

#3. Solve for x: $7^x = 9$

$\log_7 7^x = \log_7 9$

$x = \log_7 9$

$x = \frac{\ln 9}{\ln 7}$ → $x = 1.12915$

#4. Solve for x: $\log(x+9) - \log(x) = 2$

$\log_{10}\left(\frac{x+9}{x}\right) = 2$

$10^2 = \frac{x+9}{x}$

$100 = \frac{x+9}{x}$

$100x = x + 9$

$99x = 9$

$x = \frac{9}{99}$ → $x = \frac{1}{11}$

#5. In a typing class, the average number of words per minute N typed after t weeks of school was found to be: $N = \frac{157}{1+5.4e^{-0.12t}}$ At what time, t (in weeks), did the class average typing speed equal 75 words per minute?

$75 = \frac{157}{1+5.4e^{-.12t}}$

$75 + (5.4)75e^{-.12t} = 157$

$-75 \quad -75$

$(5.4)(75)e^{-.12t} = 82$

$e^{-.12t} = \frac{82}{(5.4)(75)}$

$-.12t = \ln\left(\frac{82}{5.4(75)}\right)$

$t = \frac{\ln\left(\frac{82}{5.4(75)}\right)}{-.12}$

$t = 13.3$ weeks

t	N
?	75

#6. Determine the initial quantity of a radioactive isotope with a half-life of 3400 years if 5 g remain after 2000 years.

$Q(t) = Q_0 e^{kt}$

$\frac{1}{2}Q_0 = Q_0 e^{k(3400)}$

$\frac{1}{2} = e^{k(3400)}$

$\ln\frac{1}{2} = k(3400)$

$k = \frac{\ln\frac{1}{2}}{3400} \approx -2.03867E^{-4}$

$5 = Q_0 e^{k(2000)}$

$Q_0 = \frac{5}{e^{k(2000)}}$

$Q_0 = 7.517$ g

t	Q
0	Q_0
3400	$\frac{1}{2}Q_0$
2000	5

#7. Evaluate the expression: $\log_m m^5$ $\boxed{5}$

#8. Solve for x: $\ln x = 2.5$

$e^{2.5} = x$

$\boxed{x = 12.1825}$

#9. Write in logarithmic form: $4^5 = 1024$

$\boxed{\log_4 1024 = 5}$

#10. Write in exponential form: $\ln a = 3$

$\boxed{e^3 = a}$

#11. Write the expression as a single logarithm: $\ln 3 + \frac{1}{2}\ln(4-x^2) - \ln x$

$\ln 3 + \ln(4-x^2)^{1/2} - \ln x$

$\ln 3 + \ln\sqrt{4-x^2} - \ln x \rightarrow \boxed{\ln\left(\frac{3\sqrt{4-x^2}}{x}\right)}$

#12. Write the expression as a sum, difference, and/or multiple of logarithms: $\log_7\left(\frac{\sqrt{x}}{4}\right)$

$\log_7 \sqrt{x} - \log_7 4$

$\log_7 x^{1/2} - \log_7 4$

$\boxed{\log_7\sqrt{x} - \log_7 4} = \boxed{\frac{1}{2}\log_7 x - \log_7 4}$

#13. Use the change of base formula to evaluate the following to 4 decimal places: $\log_6 14$ $= \frac{\ln 14}{\ln 6}$

$= \boxed{1.4729}$

#14. Find the balance after 20 years if $350 is invested in an account that pays 7.5% interest compounded monthly.

$t = 20$
$P = 350$
$r = .075$
$n = 12$

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

$A = 350\left(1 + \frac{.075}{12}\right)^{12(20)}$

$= \boxed{\$1561.29}$

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