Secondary Math III
Unit 10 Practice Test

Name Key
Period

1. Expand the logarithmic expression: $\log_6 \frac{\sqrt{x}}{36}$

$= \log_6 \sqrt{x} - \log_6 36$

$= \log_6 x^{\frac{1}{2}} - 2$

$= \boxed{\frac{1}{2}\log_6 x - 2}$

2. Solve the equation: $e^{x^2+7} = e^{-6x+2}$

$x^2 + 7 = -6x + 2$

$x^2 + 6x + 5 = 0$

$(x+5)(x+1) = 0$

$\boxed{x = -5}$ $\boxed{x = -1}$

3. Simplify the expression: $\log 10^{5x}$

$10^? = 10^{5x}$

$\boxed{5x}$

4. Use a calculator to evaluate the expression: $\log_{0.5} 14$

calc → $\boxed{-3.807}$

5. Solve the equation: $\log 2 + \log x = 1$

$\log 2x = 1$

$10^1 = 2x$

$\frac{10}{2}$

$\boxed{x = 5}$ check ✓

6. Condense the logarithmic expression: $\frac{1}{2}\ln(x-3) - 2\ln x$

$= \ln (x-3)^{\frac{1}{2}} - \ln x^2$

$= \ln \sqrt{x-3} - \ln x^2$

$= \boxed{\ln \frac{\sqrt{x-3}}{x^2}}$

Given $\log_a 2 \approx 0.356$, $\log_a 3 \approx 0.565$. ***and*** $\log_a 5 \approx 0.827$, ***use the properties of logarithms to evaluate the following. Round approximate answers to 3 decimal places.***

7. $\log_a \frac{4}{3} = \log_a \frac{2 \cdot 2}{3}$

$= \log_a 2.2 - \log_a 3$

$= \log_a 2 + \log_a 2 - \log_a 3$

$= .356 + .356 - .565$

$= \boxed{.147}$

8. $\log_a 27 = \log_a 3^3$

$= 3 \log_a 3$

$= 3(.565)$

$= \boxed{1.695}$

9. Use the properties of logarithms to expand the expression:

$$\ln\left(\frac{a^3\sqrt{c}}{b^5}\right) = \ln a^3 + \ln\sqrt{c} - \ln b^5$$
$$= 3\ln a + \ln c^{\frac{1}{2}} - 5\ln b$$
$$= \boxed{3\ln a + \tfrac{1}{2}\ln c - 5\ln b}$$

10. Use the properties of logarithms to condense the expression (write as a single logarithm):

$$3\log_4 x + 3\log_4 y - 3\log_4 z$$
$$= \log_4 x^3 + \log_4 y^3 - \log_4 z^3$$
$$= \boxed{\log_4 \frac{x^3 y^3}{z^3}}$$

Solve the following equations. Check for extraneous solutions where needed. *Round approximate answers to 3 decimal places.*

11. $5^{x-3} = 25$

$\log_5 25 = x-3$

$2 = x-3$

$+3 \quad +3$

$\boxed{x=5}$

12. $\log_3(x-6) + \log_3 x = 3$

$\log_3(x-6)x = 3$

$\log_3(x^2-6x) = 3$

$3^3 = x^2-6x$

$27 = x^2-6x-27$

$0 = x^2-6x-27$

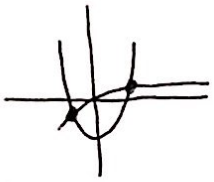
$0 = (x+3)(x-9)$

$\boxed{x=9}$

~~$x=-3$~~ extraneous

13. $\log(x+3) = x^2-4$

(Solve Graphically on #13 only)



$\boxed{x=-2}$

$\boxed{x=2.171}$

14. $5-3\ln x = 16$

$-5 \quad -5$

$\frac{-3\ln x}{-3} = \frac{11}{-3}$

$\ln x = -\frac{11}{3}$

$e^{-11/3} = x$

$x = \boxed{.026}$

15. $\frac{8e^{x+2}}{8} = \frac{32}{8}$

$e^{x+2} = 4$

$\ln 4 = x+2$

$-2 \quad -2$

$x = \boxed{-.614}$

16. $\log_2 26 = \log_2(4x+2)$.

$26 = 4x+2$

$-2 \quad -2$

$\frac{24}{4} = \frac{4x}{4}$

$\boxed{x=6}$

Use the following formulas for questions 9 and 10: $A = P\left(1+\frac{r}{n}\right)^{nt}$ $A = Pe^{rt}$

17. How much money, to the nearest dollar, is in an account after 10 years, if $10,000 is invested now at 4% interest compounded quarterly?

$A = 10000\left(1+\frac{.04}{4}\right)^{4(10)}$

$A = \$14,888.64$

18. How much should you invest (to the nearest dollar) in an account giving 4% interest compounded continuously if you want to have $5,500 in seven years?

$\frac{5500}{e^{.04(7)}} = \frac{Pe^{.04(7)}}{e^{.04(7)}}$

$P = \$4,156.81$

19. The radioactive isotope Actinium-227 has a half-life of 26 years.

a. Use the half-life to find k. (Hint: Use the model $y = Ce^{kt}$.) Round to three decimal places.

$\frac{50}{100} = \frac{100e^{k(26)}}{100}$

$\frac{1}{2} = e^{26k}$

$\frac{\ln\frac{1}{2}}{26} = \frac{26k}{26}$

$k = -.027$

b. A sample contains 2.1 grams of Actinium-227. How much Actinium-227 will remain in the sample in 77 years? Round answer to one decimal place.

$y = 2.1e^{-.027(77)}$

$y = .263$ .3 grams

20. Given that $pH = -\log x$, where x is the concentration of hydrogen ion, find the hydrogen ion concentration of a Seawater, with a pH of 8.6.

$\frac{8.6}{-1} = \frac{+\log x}{-1}$

$-8.6 = \log x$

$10^{-8.6} = x$

$x = .00000000251$