Algebra 2
Chapter 7 Review

Name ____________________
Date ____________________
Period ____________________

I. Solve the equation.

1. $8^{2x-4} = 4^{2x-6}$

$\log_2 2^{3(2x-4)} = \log_2 2^{2(2x-6)}$

$3(2x-4) = 2(2x-6)$

$6x-12 = 4x-12$

$2x = 0$

$\boxed{x=0}$

2. $5^{2x} = 42$

$\log_5 5^{2x} = \log_5 42$

$2x = \log(42)/\log(5)$

$2x = 2.32$

$\boxed{x=1.16}$

1. $x=0$

2. $x=1.16$

3. $\left(\frac{1}{36}\right)^{2x} = 6^{x+4}$

$\log_6 6^{-2(2x)} = \log_6 6^{x+4}$

$-2(2x) = x+4$

$-4x = x+4$

$-5x = 4$

$\boxed{x = -\frac{4}{5}}$

4. $3(4)^{x-3} + 8 = 38$

$3(4)^{x-3} = 30$

$\log_4 4^{x-3} = \log_4 10$

$x-3 = \log_4 10$

$x-3 = 1.66$

$\boxed{x=4.66}$

3. $x = -\frac{4}{5}$

4. $x=4.66$

II. Solve and check for extraneous solutions.

5. $\log(x-5) = 2$

$10 \quad 10$

$x-5 = 10^2$

$x-5 = 100$

$\boxed{x=105}$

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

$3^{\log_3 x(x-6)} = 3^3$

$x^2-6x = 27$

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

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

$x = 9, -3$

4. $x=105$

5. $\boxed{x=9}$, $\cancel{-3}$

7. $\log_4(2x-5) = \log_4(3x-2)$

$4 \quad 4$

$2x-5 = 3x-2$

$-5 = x-2$

$\cancel{\boxed{-3=x}}$

8. $4\ln(x+3) = 84$

$e^{\ln(x+3)} = e^{21}$

$x+3 = 1,318,815,734$

$x = 1,318,815,731$

7. No Solution

8. $x = 1,318,815,731$

III. Real world example problems. Solve using logarithms.

8. You deposit \$5000 in an account that pays 3% annual compounded quarterly. How long does it take the balance to \$6000? Solve the problem using a logarithm, then check your answer using the table function in your calculator. Use $A = P\left(1+\frac{r}{n}\right)^{nt}$. Hint: (take the log of both sides)

$6000 = 5000\left(1+\frac{0.03}{4}\right)^{4t}$

$6000 = 5000(1.0075)^{4t}$

$1.2 = 1.0075^{4t}$

$\log_{1.0075} 1.2 = \log_{1.0075} 1.0075^{4t}$

$\log_{1.0075}(1.2) = 4t$

$24.4 = 4t$

$\boxed{6.1 \text{ years} = t}$

9. *Oceanography* The density d (in grams per cubic centimeter) of seawater with a salinity of 30 parts per thousand is related to the water temperature T (in degrees Celsius) by the following equations:

$$d = 1.0245 - e^{0.1226T - 7.828}$$

For deep water in South Atlantic Ocean off Antarctica, $d = 1.0241 g/cm^3$. Solve the equation.

a. Substitute the value for d.
b. Isolate the base of e.
c. Use the proper logarithm to solve for the exponent.

$1.0241 = 1.0245 - e^{0.1226T-7.828}$

$-0.0004 = e^{0.1226T-7.828}$

$\ln 0.0004 = \ln e^{0.1226T-7.828}$

$-7.82 = 0.1226T - 7.828$

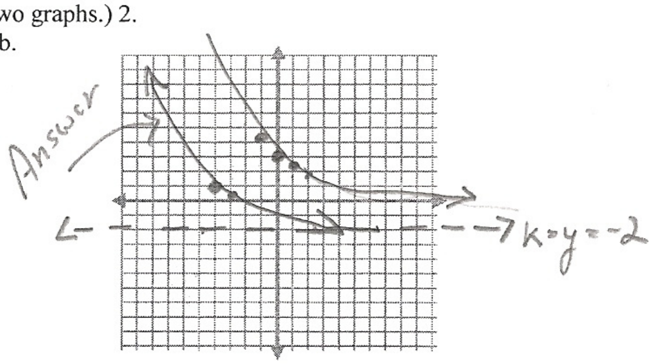
$0.0040 = 0.1226T$

$\boxed{0.032°C = T}$

IV. Graphing.

10. Build a table based on the parent function. Then graph the function. Finally, shift the function and state the domain and range. (Hint: you should have two graphs.) 2.

b.



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

a. This table is for the parent function.

x	-1	0	1	2
y	4	3	2.25	1.7

c. h = -4, k = -2

d. domain all real #

e. range $y > -2$

f. Is the function exponential growth or decay? decay

g. The rate of decay is 25 %.

$1 - \frac{3}{4} = \frac{1}{4} = 0.25 = 25\%$

V. Evaluate without a calculator.

11. $\log_2 16$ 12. $\log_9 1$ 13. $\log_3 \frac{1}{27}$

$2^x = 16$

$9^x = 1$

$3^x = \frac{1}{27}$

11. 4

12. 0

13. -3

VI. Expand the expression.

14. $\ln x^4 y^3$

$\ln x^4 + \ln y^3$

$4 \ln x + 3 \ln y$

15. $\log_3 \frac{t^3}{z^6}$

$\log_3 t^3 - \log_3 z^6$

$3 \log_3 t - 6 \log_3 z$

14. $4 \ln x + 3 \ln y$

15. $3 \log_3 t - 6 \log_3 z$

VII. Condense the expression.

16. $3 \ln x + 4 \ln y - \ln z$

$\ln x^3 + \ln y^4 - \ln z$

$\ln \frac{x^3 y^4}{z}$

17. $\log_3 x - 4 \log_3 z$

$\log_3 x - \log_3 z^4$

$\log_3 \frac{x}{z^4}$

16. $\ln \frac{x^3 y^4}{z}$

17. $\log_3 \frac{x}{z^4}$

For 18-19, use the following information.

Initial Deposit You want to have \$10,000 in your account after five years. Find the amount your initial deposit should be for each of the following described situations.

18. The account pays 3.5% annual interest compounded monthly.

$10{,}000 = P\left(1 + \frac{0.035}{12}\right)^{12(5)}$

$10{,}000 = P(1.909)$

18. \$8,396.71

19. The account pays 2.75% annual interest compounded quarterly.

$10{,}000 = P\left(1 + \frac{0.0275}{4}\right)^{4(5)}$

$10{,}000 = P(1.147)$

19. \$8719.45

For 20-22, use the following information.

Depreciation You buy a new car for \$22,500. The value of the car decreases by 25% each year.

20. Write an exponential decay model giving the car's value V (in dollars) after t years.

$y = 22{,}500(1 - 0.25)^t$

20. $y = 22500(0.75)^t$

21. What is the value of the car after three years?

$y = 22{,}500(0.75)^3$

21. 9,492.19

22. In approximately how many years is the car worth \$5300?

$5{,}300 = 22{,}500(0.75)^t$

$0.236 = 0.75^t$

$\log_{0.75} \quad \log_{0.75}$

$\boxed{5.03 = t}$

22.. A little after 5 years.

For 23-26, Larry started out with 6 bunnies in his bunny farm. When he woke up the next day he had 18 in the farm. The following day there were 54 bunnies in the farm.

23. Complete the table based on Tom's observations.

# of Days (t)	0	1	2	3	4	5	6
# of bunnies (y)	6	18	54	162	486	1458	4374
Pattern	$6\cdot3^0$	$6\cdot3^1$	$6\cdot3^2$	$6\cdot3^3$	$6\cdot3^4$	$6\cdot3^5$	$6\cdot3^6$

24. Larry is unable to count all of the bunnies so he needs a little help to find out how many bunnies there will be after "t" days. Help Larry by writing the model (equation) for the number of bunnies that Larry will have after "t" number of days.

$$\boxed{y = 6(3)^t}$$

25. How many bunnies are there after 30 days? Write the number in scientific notation and as a non-scientific notation number. Explain how you found this answer?

$$y = 6(3)^{30}$$
$$y = 1.24 \times 10^{15} \approx 1{,}240{,}000{,}000{,}000{,}000$$

26. After how many days will there be 86, 093.442 bunnies? Use logarithms to solve the equation and then check using the tables on your calculator.

$$86{,}093{,}442 = 6(3)^t$$
$$\log_3 14348907 = \log_3 3^t$$
$$\boxed{15 \text{ days} = t}$$

For 27, Your friends gather data to find the decay factor of a bouncing Teddy Bear. Since they depend on you to do the math they give you the data that they collected in a table. They initially drop Teddy from 800 ft. and measure the bounce at its maximum height. They collected data up to three bounces. Let x be the number of bounces and h(x) be the height.

X bounces	0	1	2	3	4	5	6	7
h(x)	800 ft.	240 ft.	72 ft.	22 ft.	6.5	1.9	0.6	0.2

a. Use the STAT key on your calculator to fill out the lists, then use the STAT and CALC key to find the exponential regression. What is the model (equation of the data)?

$$y = 797(0.3)^t$$

b. Fill out the rest of the table.

c. What is the rate of decay? Write as a percent. 70% $1 - r = 0.3$ $r = 0.7$ or 70%

d. What will the height of the Teddy Bear be after 6 bounces? 0.6 ft

e. After how many bounces will the ball be at about zero ft? about 10 bounces