Algebra 3-4
Unit 3 Review

Name: _____ Per: _____
Date: _____

*****COMPLETE ON A SEPARATE SHEET OF PAPER*****

1. Aaron invests $20,000 at 5% interest. How much does he have in the account after 15 years?

$20000(1+.05)^{15} = 41,578.56$

2. The value of a new $20,000 minivan depreciates 15% per year. Find its value after 5 years.

$20000(1-.15)^5 = 8874.11$

3. For the function machine $f(x) = 3^x$:

   a. Find $f(2)$ $3^2 = 9$

   b. Find $f(-1)$ $3^{-1} = 1/3$

   c. If 81 came out, what went in? $3^x = 81 \rightarrow x = 4$

   d. If 0 came out, what went in? $3^x = 0 \rightarrow$ No Solution!

   e. If 8 came out, what went in? $3^x = 8 \rightarrow x = \log_3 8 = 1.89$

   $\log_3$ $\log_3$

4. For each equation below, solve for x. Show all steps!

   a. $\frac{5x^3}{5} = \frac{80}{5}$ $x = 16^{1/3}$ $x = 2.52$

   $X^3 = 16$

   b. $\left(\frac{3x^4}{5} = 54\right) \cdot 5$

   $\frac{3x^4}{3} = \frac{270}{3}$ $x = 90^{1/4}$ $x = 3.08$

   $x^4 = 90$

   c. $\frac{2x^{\frac{1}{3}}}{2} = \frac{126}{2}$ $(x^{\frac{1}{3}})^3 = (64)^3$ $x = 262144$

5. Rewrite in exponential form and solve.

   EXAMPLE:

   $\log_2 64 = y$ ----->> $2^y = 64$, or "What power of 2 is the number 64?". Answer: 6

   a. $\log_2 8 = y$ $2^y = 8 \rightarrow y = 3$

   b. $\log_4 64 = y$ $4^y = 64 \rightarrow y = 3$

   c. $\log_2 x = -6$ $2^{-6} = x = 1/64$

   d. $\log_3 \frac{1}{3} = y$ $3^y = \frac{1}{3} \rightarrow y = -1$

   e. $\log_2 x = -5$ $2^{-5} = x = 1/32$

   f. $\log_x \frac{1}{2} = 8$ $x^8 = \frac{1}{2}$ $x = (\frac{1}{2})^{1/8} = .917$

6. Rewrite in logarithmic form and solve.

   a. $20 = 2(7^x) - 6$ $+6$ $+6$ $\rightarrow \frac{26}{2} = \frac{2(7)^x}{2} \rightarrow 13 = 7^x$ $\log_7 13 = x$ $1.32 = x$

   b. $15.3 = 5^{(x+2)}$ $\log 5$ $\log 5$

   $1.69 = x + 2 \rightarrow x = -.305$

   c. $75 - 5(3^x) = -150$ -75 -75

   $\frac{-5(3)^x}{-5} = \frac{-225}{-5}$

   $3^x = 45 \rightarrow x = \log_3 45$ $x = 3.46$

7. Do you need to change the form of this equation to solve? Show how to solve.

   a. $\log_4 64 = x - 1$ No. $3 = x - 1$ $4 = x$

   b. $\log_4 \frac{1}{64} = x$ No. $-3 = x$

   c. $\log_9(-11x + 2) = \log_9(x^2 + 30)$ 9 9 Yes

   $-11x + 2 = x^2 + 30$

   Solve by graphing. $x = -7$ & $x = -4$

   d. $\log(5x) = \log(2x + 9)$ 10 10 Yes.

   $5x = 2x + 9$

   $-2x$ $-2x$

   $\frac{3x}{3} = \frac{9}{3}$

   $x = 3$

8. Mixed Review. Solve.

a. $-6\log_3(x-3) = -24$ → $\log_3(x-3) = 4$ → $3^4 = x-3$

b. $\log_5 \frac{1}{125} = x$ → $81 = x-3$

c. $\log_y \frac{1}{27} = -3$ → $64 = x$

d. $8^x = 190$ → $x = -3$

$(y^{-3})^{-1/3} = \left(\frac{1}{27}\right)^{-1/3}$ → $y = 3$

$x = \log_8 190 = 2.52$

9. Can the value of $\log_2(-4)$ be found? What about the value of $\log_2 0$? Why or why not? What does this tell you about the domain of $\log_b x$? No! No! Exponents never reach 0 or negatives. Domain is only positive

10. You get \$500 for your 18th birthday and decide to open a savings account. You find an amazing bank that will guarantee an interest rate of 6.5%.

a. Write an exponential equation to model the situation. $500(1+.065)^x$

b. How much money will be in the account when you are 30? Solve algebraically. $x = 12$ So 1064.55

c. How old will you be when your account is worth \$10,000? Solve algebraically.

$\frac{10000}{500} = \frac{500(1.065)^x}{500}$ → $20 = 1.065^x$ → $x = 47.57$

$\log_{1.065}$ $\log_{1.065}$

11. The number of fish in a pond is 150. The fish population is growing exponentially at a rate of 15.5% a month.

a. Write an exponential equation to model the situation. $150(1+.155)^x$

b. How many fish will be in the pond after a year? $150(1+.155)^{12} = 845.42$

c. How long will it take for the population to reach 10,000 fish? Solve algebraically.

$\frac{10000}{150} = \frac{150(1.155)^x}{150}$ → $66.66 = 1.155^x$ → $x = 29.14$

$\log_{1.155}$ $\log_{1.155}$

12. The mosquitoes in the campground are decreasing exponentially. After 10 minutes there are 880 mosquitoes. After 14 minutes there are only 460 mosquitoes.

a. Write an exponential equation to model the situation. $\left(\frac{880}{460}\right)^{1/4} = 1.18$

b. Assuming the mosquitoes continue to decrease at this rate, how long will it take until there are only 50 mosquitoes left? Solve algebraically.

Oops.

a) $y = b(1.18)^x$

$880 = b(1.18)^{10}$

$\frac{880}{5.23} = \frac{b(5.23)}{5.23}$

$168.26 = b$

$y = 168(1.18)^x$

b) $\frac{50}{168} = \frac{168(1.18)^x}{168}$

$.297 = 1.18^x$