Math 3 Name:_____

Unit 2 Day 5 CW(1) Date:_____

Use the rules of exponents or logarithms to find the value of x in each equation.

1. $(2^{12})^{3} = 2^{2x}$

2. $(11^{x})(11^{15}) = 11^{105}$

3. $\frac{4^{x}}{4^{34}} = 4^{20}$

4. $(5^{10})^{x} = 5^{50}$

5. $(6^{23})(6^{x}) = 6^{57}$

6. $\frac{3^{22}}{3^{x}} = 3^{7}$

7. $(6^{2})(36^{x}) = 6^{12}$

8. $\left(4^{\frac{1}{2}}\right)\left(16^{\frac{1}{4}}\right) = x$

9. $\left(8^{\frac{1}{3}}\right)\left(64^{\frac{3}{2}}\right) = x$

10. $(25^{3})(5^{9}) = 125^{x}$

11. $(8^{x})(2^{5}) = 4^{7}$

12. $\left(3^{\frac{1}{2}}\right)\left(27^{\frac{1}{2}}\right) = 9^{x}$

Log both sides 13-20

13. $10^{x} = 10,000$

14. $10^{x+3} = 1,000$

15. $10^{3x+2} = 1,000$

16. $10^{2x} = 50$

17. $3(10)^{x+4} = 3,000$

18. $12(10)^{3x+2} = 120$

19. $3(10)^{x+4} + 7 = 28$

20. $7(10)^{x-2} = 49$

Rewrite into exp. form 21-24

21. $\log_{x} 125 = 3$

22. $\log(8x + 12) = 2$

23. $\log_{8} x = -1$

24. $\log_{x} 16 = 4$

20. If a scientist counts 50 bacteria in an experimental culture and observes that one hour later the count is up to 100 bacteria, the function $P(t) = 50(10^{0.3t})$ provides an exponential growth model that matches these data points.

    a. Explain how you can be sure that $P(0) = 50$.

    b. Show that $P(1) = 100$.

    c. Use the given function to estimate the time when the bacteria population would be expected to reach 1,000,000.

        i. Explain how to find the time by numerical or graph estimation.

        ii. Explain how to find the time by using common logarithms and algebraic reasoning.

21. In a drop of pond water, there are 18 protozoa. Ten hours later, there are 180 protozoa in the dish.
    $P(t) = 18(10^{0.1t})$ provides an exponential growth model that matches these data points.

    a. Use the given function to estimate the time when the bacteria population would be expected to reach 500,000.

        iii. Explain how to find the time by numerical or graph estimation.

        iv. Explain how to find the time by using common logarithms and algebraic reasoning.