Honors Math 3 **Unit 3 Exp/Log Review** **Name** _____

DO ALL PROBLEMS ON NOTEBOOK PAPER! SHOW ALL WORK!

Without graphing, determine whether each equation represents exponential growth or exponential decay. Then determine the percent increase or decrease.

1. $y = 2\left(\frac{3}{5}\right)^x$

2. $y = -3(1.05)^x$

Write an exponential model (in the form $y = ab^x$) that describes the situation.

3. You bought a sculpture for $380. Each year the value of the sculpture increases by 8%. What is the value after t years? Find the value in 10 years.

4. You buy a new car valued at $19,000. It decreases at a rate of 14% each year. What is the value of the car in t years? When will the car be worth half of the value you bought it for?

Write each equation in exponential form.

5. $\log_8 2 = \frac{1}{3}$

6. $\ln 7 = x$

Write each equation in logarithmic form.

7. $4^{\frac{3}{2}} = 8$

8. $e^5 = 2y$

Evaluate each expression.

9. $5^{\log_5 1}$

10. $\log 10$

11. $\log 10^5$

12. $\ln 1$

13. $e^{\ln 5}$

Solve each equation.

14. $\log_2 x + \log_2 9 = \log_2 18$

15. $2\log_6 8 + \log_6 y - 2\log_6 2 = \log_6 4$

16. $\log_4 x = 3$

17. $2^x = 53$

18. $\ln(x+3) = 2$

19. $\log_6 x + \log_6 (x-5) = 2$

20. $e^{3x} = 124$

21. $4^{3x} + 2 = 3$

22. $2^{3x} = 16^{2x-1}$

23. $5 - e^{x-1} = 2$

24. You deposit $1000 in an account that pays 8.5% interest compounded quarterly.
    a) How much money will you have in the account after 5 years?
    b) How long will it take for the balance in the account to double?
    b) How long will it take to reach $5000?

5. Suppose you deposit $3000 in an account that pays 4% interest compounded continuously.
    a) What is the balance in the account after 12 years?
    b) When will it double?

. Find the inverse of $f(x) = 3x - 4$.

27. Given $f(x) = 2x + 1$ *and* $g(x) = x^2 - 3$ *find* $g \circ f(x)$.

Solve: $x^2 - 4x - 8 = 0$

29. Solve $2|x-3| - 1 > 9$

① Decay 40%

$b = 1 - r$

$\frac{3}{5} = 1 - r$

$-.4 = -r$

$.4 = r$

② Growth 5%

$b = 1 + r$

$1.05 = 1 + r$

$.05 = r$

$5\% = r$

③ $y = a(1+r)^x$

$y = 380(1+0.8)^{10}$

$y =$ $820.39

④ $y = a(1+r)^x$

$y = 19{,}000(1-.14)^x$

$9500 = 19{,}000(.86)^x$

$Y_2 = .86^x$

$\frac{\log(Y_2)}{\log .86} = \frac{x \log .86}{\log .86}$

~~4.60 = x~~

about 5 years

⑤ $\log_8 2 = \frac{1}{3}$

$8^{\frac{1}{3}} = 2$

⑥ $\ln 7 = x$

$\log_e 7 = x$

$e^x = 7$

⑦ $\log_4 8 = \frac{3}{2}$

⑧ $\ln 2y = 5$

(9) $5^{\log_5 1}$

$\boxed{1}$

(10) $\log_{10} 10^{\log 10}$

$\boxed{1}$

(12) $\ln 1$

$\boxed{0}$

(13) $e^{\ln 5}$

$\boxed{5}$

(11) $\log 10^5$

$\boxed{5}$

(14) $\log_2 x + \log_2 9 = \log_2 18$

$\log_2 9x = \log_2 18$

$9x = 18$

$\boxed{x = 2}$

(15) $2\log_6 8 + \log_6 y - 2\log_6 2 = \log_6 4$

$\log_6 8^2 + \log_6 y - \log_6 2^2 = \log_6 4$

$\log_6 64 + \log_6 y - \log_6 4 = \log_6 4$

$\log_6 \frac{64y}{4} = \log_6 4$

$\log_6 16y = \log_6 4$

$16y = 4$

$\boxed{y = \frac{1}{4}}$

(16) $\log_4 x = 3$

$4^3 = x$

$\boxed{64 = x}$

(17) $2^x = 53$

$\log 2^x = \log 53$

$x \log 2 = \log 53$

$x = \frac{\log 53}{\log 2}$

$\boxed{x \approx 5.73}$

(18) $\ln(x+3) = 2$

$e^2 = x + 3$

$e^2 - 3 = x$

$\boxed{4.39 = x}$

(19) $\log_6 x + \log_6 (x-5) = 2$

$\log_6 x(x-5) = 2$

$\log_6 x^2 - 5x = 2$

$6^2 = x^2 - 5x$

$x^2 - 5x - 36 = 0$

$(x-9)(x+4) = 0$

$\boxed{x = 9}$

(20) $e^{3x} = 124$

$\ln e^{3x} = \ln 124$

$3x = \ln 124$

$x = \frac{\ln 124}{3}$

$\boxed{x = 1.61}$

(21) $4^{3x} + 2 = 3$

$4^{3x} = 1$

$\log 4^{3x} = \log 1$

$3x \log 4 = \log 1$

$\frac{3x}{3} = \frac{\log 1}{\log 4}$

$\frac{3}{3}$

$\boxed{x = 0}$

(22) $2^{3x} = 16^{2x-1}$

$2^{3x} = 2^{4(2x-1)}$

$3x = 8x - 4$

$-5x = -4$

$\boxed{x = 4/5}$

(23) $5 - e^{x-1} = 2$

$-e^{x-1} = -3$

$e^{x-1} = 3$

$\ln e^{x-1} = \ln 3$

$x - 1 = \ln 3$

$x = \ln 3 + 1$

$\boxed{x \approx 2.10}$

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

a) $A = 1000(1 + \frac{0.085}{4})^{(4 \cdot 5)}$

$\boxed{A = \$1522.79}$

b.) $2000 = 1000(1 + \frac{0.085}{4})^{4t}$

$2000 = 1000(1.02125)^{4t}$

$2 = 1.02125^{4t}$

$\log 2 = 4t \log(1.02125)$

$\frac{\log 2}{\log(1.02125)} = \frac{4t}{4}$

$8 = t$ x 8 years

(24) c) $5000 = 1000\left(1+\frac{0.085}{4}\right)^{4t}$

$5000 = 1000(1.02125)^{4t}$

$5 = 1.02125^{4t}$

$\log 5 = \log 1.02125^{4t}$

$\log 5 = 4t \log 1.02125$

$\frac{\log 5}{\log 1.02125} = \frac{4t}{4}$

$41 = t$

$t \approx 19$ years

(25) $A = Pe^{rt}$

a) $A = 3000e^{0.04(12)}$

$A = \$4848.22$

b) ~~$6000 = 3000e^{0.04t}$~~

$6000 = 3000e^{0.04t}$

$2 = e^{0.04t}$

$\ln 2 = \ln e^{0.04t}$

$\frac{\ln 2}{0.04} = t$

$17.3 = t$

(26) $f(x) = 3x - 4$

$x = 3y - 4$

$x + 4 = 3y$

$\frac{1}{3}x + \frac{4}{3} = y$

f^{-1}

$\frac{x+4}{3}$

(27) $g(f(x))$

$g(x) = x^2 - 3$

$(2x+1)^2 - 3$

$4x^2 + 4x + 1 - 3$

$g(f(x)) = 4x^2 + 4x - 2$

(26) $f(x) = 3x - 4$

$y = 3x - 4$

$x = 3y - 4$

$\frac{x}{3} + \frac{4}{3} = \frac{3y}{3}$

$\boxed{\frac{1}{3}x + \frac{4}{3} = y^{-1}}$

(27) $g \circ f(x)$

$g(f(x))$

$g(2x+1)$

$(2x+1)^2 - 3$

$4x^2 + 4x + 1 - 3$

$\boxed{4x^2 + 4x - 2}$

(28) $x^2 - 4x - 8 = 0$

$x^2 - 4x + \boxed{4} = 8 + \boxed{4}$

$\sqrt{(x-2)^2} = \sqrt{12}$

$x - 2 = \pm 2\sqrt{3}$

$x = 2 \pm 2\sqrt{3}$

(29) $2|x-3| - 1 > 9$

$2|x-3| > 10$

$|x-3| > 5$

$x - 3 > 5$ $\quad x - 3 < -5$

$x > 8$ $\quad x < -2$