$A(t) = Pe^{rt}$ *continuously $A(t) = A_0(1 \pm r)^t$ * increase/decrease $A(t) = A_0\left(1 + \frac{r}{n}\right)^{nt}$ * compound yearly, quarterly, semi-annually, monthly

Ch.6 Review Exponential/Log Functions

Name _____

1. You invest $4000 into an account earning 3% interest. Find the amount at the end of 12 years if the interest is:

   a.) compounded continuously $A(t) = Pe^{rt}$ $A(12) = 4000e^{.03(12)} \approx \$5,733.31$

   b.) compounded quarterly $A(t) = A_0\left(1 + \frac{r}{n}\right)^{nt}$ $A(12) = 4000\left(1 + \frac{.03}{4}\right)^{4(12)} \approx \$5,725.64$

Solve each equation.

2. $12 - 4^x = -5$

$-12 \quad -12$

$\frac{-4^x}{-1} = \frac{-17}{-1}$

$\log_4 4^x = \log_4 17$

$x = \frac{\log 17}{\log 4} \approx 2.04$

3. $\log_2 32 = x$

$x = \frac{\log 32}{\log 2}$

$x = 5$

4. $\log 5 - \log 2x = 1$

$\log\left(\frac{5}{2x}\right) = 1$

$10^{\log\left(\frac{5}{2x}\right)} = 10^1$

$\frac{5}{2x} = 10$ $2x$

$\frac{5}{1} = \frac{20x}{2}$

$\frac{5}{20} = \frac{20x}{20}$

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

5. $\log(2x+1) = \log(5x-8)$

$\log(2x+1) - \log(5x-8) = 0$

$10^{\log\left(\frac{2x+1}{5x-8}\right)} = 10^0$

$\frac{2x+1}{5x-8} = 1 \quad (5x-8)$

$2x + 1 = 5x - 8$

$-2x \quad -2x$

$1 = 3x - 8$

$+8 \quad +8$

$9 = 3x$

$x = 3$

Evaluate each logarithm. Show work.

6. $\log_2 64$ $x = 2$

7. $\log_{\frac{1}{3}} \frac{1}{9} = x$ $\frac{\log \frac{1}{9}}{\log \frac{1}{3}} = x$

8. $\log_3 81$

9. $\log_3 \frac{1}{9}$

10. $\log_{25} \frac{1}{5}$

What is each logarithmic expression written as a single logarithm?

11. $\log x - 5\log y$

$= \log x - \log y^5$

$= \log\left(\frac{x}{y^5}\right)$

12. $\log x - \log xy$

$= \log\left(\frac{x^1}{xy}\right)$

$= \log\left(\frac{1}{y}\right)$

13. $4(\log x + \log y)$

$= 4(\log(xy))$

$= \log(xy)^4$

$= \log(x^4y^4)$

Use the change of base formula to rewrite the expression using common logarithms and find the answer to the nearest tenth-thousandth:

14. $\log_6 41$

15. $\log_5 30$

16. My hourly wage is increased by 5% each year. If my wage is now $10 per hour, when will it reach $17? $r = .05$ A_0

$A(t) = A_0(1 + r)^t$

$17 = 10(1 + .05)^t$

$\frac{17}{10} = \frac{10(1.05)^t}{10}$

$\log_{1.05} 1.7 = \log_{1.05} 1.05^t$

$\frac{\log 1.7}{\log 1.05} = t$

$t \approx 10.9$ yrs

17. The number of bacteria in a colony is 200. If these bacteria grow at a continuously hourly rate of 0.235, how many hours will it take for the number of bacteria to reach 250? $r = 0.235$

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

$\frac{250}{200} = \frac{200e^{0.235t}}{200}$

$\log_e 1.25 = \log_e e^{0.235t}$

$\frac{\ln 1.25}{0.235} = \frac{0.235t}{0.235}$

$t \approx 0.95$ hrs

18. Write the equation in logarithmic form: $4^3 = 64$ $\log_4$

$3 = \log_4 64$

19. Write the equation in exponential form: $\log 1000 = 3$ $10^{\log}$ 10

$1000 = 10^3$

True or False?

20. $\log_2 64 = 6$ is read "log base 2 of 64 is 6" True

21. The answer to a logarithm is the exponent of the related exponential equation. True

22. The inverse of the function $y = e^x$ is the natural log function. $\log e$ True

23. A logarithm with base 10 is a common logarithm. $\log x$ True

Ch.6 Review Exponential/Log Functions

24. The change of base formula is used to evaluate a log in any base.

1. You invest $2000 into an account earning 2% interest. Find the amount at the end of 5 years if the interest is:

a.) compounded continuously

b.) compounded monthly

2. My hourly wage is increased by 4% each year. If my wage is now $12 per hour, when will it reach $15?

3. The number of bacteria in a colony is 100. If these bacteria grow at a continuously hourly rate of 0.312, how many hours will it take for the number of bacteria to reach 220?

4. Write the equation in logarithmic form: $4^{-2} = \frac{1}{16}$ 5. Write the equation in exponential form: $\log 100 = 2$

Evaluate each logarithm. Show work.

6. $\log_3 243$ 7. $\log_{\frac{1}{2}} \frac{1}{8}$ 8. $\log_2 32$ 9. $\log_3 \frac{1}{27}$ 10. $\log_{64} \frac{1}{4}$

What is each logarithmic expression written as a single logarithm?

11. $\log w - \log wc$ 12. $\log x - 3\log y$ 13. $2(\log x + \log y)$

Solve each equation. Round to the nearest ten-thousandth.

14. $10 - 3^x = -2$ 15. $log_3 81 = x$ 16. $\log(3x+1) = \log(7x-6)$ 17. $log\,4 - log\,3x = 2$

18. Use $\log_3 4 \approx 1.262$ *and* $\log_3 5 \approx 1.465$ to evaluate $\log_3 20$ to the nearest tenth-thousandth:

True or False?

19. The inverse of the function $y = 10^x$ is the common log function.

20. The answer to a logarithm is the exponent of the related exponential equation.

21. $\log_3 9 = 2$ is read "log base 3 of 9 is 2"

22. A logarithm with base e is a natural logarithm.

Ch.6 Review Exponential/Log Functions

23. The change of base formula is used to evaluate a log in any base.

Warm-Up

Solve each equation.

1. $4^x - 5 = 3$
2. $\log 2x = 3$

Warm-Up

Solve each equation.

1. $2^x - 5 = 3$
2. $log_2 128 = x$
3. Suppose you invest $2000 at an annual interest rate of 5% compounded quarterly. How much will you have in the account in 10 years?