Logarithms and exponentials

Rewrite in exponential form

1. $\log_5 25 = 2$ $5^2=25$

2. $\log_4 64 = 3$ $4^3=64$

Rewrite in log form

3. $5^4 = 625$ $\log_5 625=4$

4. $9^3 = 729$ $\log_9 729=3$

5. $e^3 = 20.086$ $\ln 20.086=3$

Condense the logs

6. $\ln 4x^2 + \ln 6x^2 - \ln 2x^2$ $\ln \frac{24x^4}{2x^2} = \ln 12x^2$

7. $\log_2 12x^4 - \log_2 4x^2$ $\log_2 3x^2$

Expand Logs

8. $\ln \frac{xy}{z}$ $\ln x + \ln y - \ln z$

9. $\log x^2y^3$ $2\log x + 3\log y$

Solve logs

10. $3e^{4x-2}=634.57$ 1.84

11. $2^{3x+5} = 400$ 1.21

12. $\log_4(x+3) + \log_4(x) = 1$ $X=1$

13. $\ln 5 + \ln(x-5) = 10$ 4410.3

Exponential functions

14. Initial population of Atlanta is 3,000 people, growing 4.6% per year.

A. what is the exponential function? $y = 3000(1.046)^x$

* B. what would the equation be if the population decreased 1.2% per 2 years? $y = 3000(.988)^{\frac{t}{2}}$

Find the growth / decay rate

15. $f(x) = 4.8(2.05)^x$ Growth 105%

16. $f(x) = 2(.325)^x$ Decay 67.5%

Do the following equations represent growth or decay?

17. $y = 15(1.3)^x$ Growth 30%

18. $y = 20(.785)^x$ Decay 21.5%

19. $y = 1254e^{.24x}$ growth 24%

20. James Hall high school's freshman student population increases 1.2% every year. There are 1203 freshmen this year. Write a function that models the amount of students per year. Find the number of freshmen after 3 years. $y = 1203(1.012)^x$ $x = 3 \rightarrow \$1246$

21. A car sells for \$25,350 but decreases in value 25% each year. Write a function that models the value of the car after x many years. Find the value of the car after 5 years. $y = 25350(.75)^x$ $x = 5 \rightarrow \$6105.67$

Other Problems

22. You have \$2250 to invest for the next 7 years. Compare the account values based on the following investments.

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

a) Interest compounded monthly at 4.0% \$2975.66

b) Interest compounded quarterly at 4.2% \$3014.39

$y = Pe^{(rt)}$

c) Interest compounded continuously at 3.9% 2956.28

$y = ab^t$

d) Interest compounded annually at 4.5% \$3061.94

23. A population of rabbits increase in t days is modeled by the equation $P = 150e^{.05t}$

a) How many rabbits are there right now? 150

b) How many rabbits will there be in 1 week? 212

Solve using logarithms:

Diego decided to invest his \$500 tax refund rather than spending it. He found a bank that would pay him 4% interest, compounded quarterly. If he deposits the entire \$500 and does not deposit or withdraw any other amount, how long will it take to double his money in the account?

$1000 = 500(1+\frac{.04}{4})^{4t}$ $2 = (1.01)^{4t}$ $\log 2 = 4t \cdot \log(1.01)$ $69.66 = 4t$

$17.42 = t$ years

Find the inverse of each function:

a) $y = \log_7(x+8)$

$x = \log_7(y+8)$

$7^x = y+8$

$y = 7^x - 8$

b) $y = \log_6(x) - 4$

$x = \log_6(y) - 4$

$x+4 = \log_6 y$

$y = 6^{x+4}$

c) $y = 4^{x+5}$

$x = 4^{y+5}$

$\log_4(x) = y+5$

$y = \log_4(x) - 5$

d) $y = 4^{x-3} + 2$

$x = 4^{y-3} + 2$

$x - 2 = 4^{y-3}$

$\log_4(x-2) = y+3$

$y = \log_4(x-2) - 3$