$f(x) = a^x$ and $g(x) = \log_a x$ are ***inverses.***

How to find the inverse of an exponential function:

1. Set the function equal to y
2. Isolate the part of the function that includes the x on one side of the equals sign
3. Swap x and y
4. Rewrite the exponential and the rest of the function as a logarithm (take the log of both sides- this will allow you to get the y out of the exponent)
5. Solve for y

Ex) Find the inverse of $k(x) = 7^{x+1} - 3$

1. $y = 7^{x+1} - 3$
2. $y + 3 = 7^{x+1}$
3. $x + 3 = 7^{y+1}$
4. $\log_7(x+3) = 7^{\log_7 y+1}$
5. $\log_7(x+3) = y + 1$
6. $\log_7(x+3) - 1 = y$

1. Find the inverse of $m(x) = 14^{x+6} + 3$

2. Graph $g(x) = \log(x-3) + 1$

3. Graph $h(x) = 5^{x-2} + 4$

4. Graph $\ln x + 3$

5. Find the domain of the functions:

a) $p(x) = \log(x-3) + 1$  b) $t(x) = \ln x + 7$  c) $r(x) = e^{x+6} - 2$

6. Write each in logarithmic form. You do not have to solve.

a) $6^{-2} = \frac{1}{36}$  b) $e^{-12x} = 7$  c) $4^{-3} = \frac{1}{64}$  d) $e^x = 4$

7. Write each in exponential form. You do not have to solve.

a) $\log_5 x = -9$  b) $\log 37 = x$  c) $\log \frac{1}{1000} = -3$  d) $\log_8 4 = \frac{2}{3}$

8. Expand using all properties that apply.

a) $\log_4 \frac{a^7}{b^3}$  b) $\log 4x^2y$  c) $\ln \frac{x^4\sqrt{y}}{z^5}$  d) $\log_3 10z$

9. Condense to one term.

a) $3\ln(x-2) - (2\ln y + 7\ln z)$  b) $6\log_2 x + \log_2 y - 5\log_2 z$  c) $2\ln 8 + 5\ln(x-4)$

10. Solve each for x. Round to 3 decimals when necessary.

a) $e^{2x} - 7e^x + 10 = 0$  b) $6^x - 28 = -8$  c) $\ln 3x = 8.2$

d) $\ln\sqrt{x+1} = 2$ e) $7 + 3\ln x = 5$ f) $6\log_3(0.5x) = 11$

g) $8(4^{6-2x}) + 13 = 41$ h) $\log_{2x} 40 = 4$

i) $\log_2 x + \log_2(x+2) = \log_2(x+6)$ j) $8(10^{3x}) = 12$

**Growth and decay**: $\boxed{y = ne^{kt}}$ where y is the final amount, n is the initial amount, k is a constant, and t is time.

**Compound interest**: $\boxed{A = P(1+\frac{r}{n})^{nt}}$ where A is the final amount, P is the initial investment, r is the interest rate, t is time, n is compounding's per year

**Continuous Compounding:** $\boxed{A = Pe^{rt}}$ where A is the final amount, P is the initial investment, r is the interest rate, and t is time.

11. $1000 is invested at 5% interest, compounded twice a year, for 1 year. What is the balance after 1 year?

12. How many years will it take for your money to triple if you deposit it into an account that pays 5% compounded continuously?

14. A certain population of bacteria doubles every 7 minutes. Assuming you started with only 1 bacterium, how many bacterium could be present at the end of 84 minutes?