

1. Sketch a graph of the functions then determine if they are invertible (aka are they one-to-one?)

(a) $f(x) = x^3 - 1$

(b) $g(x) = 2x^2 + 1$

2. Are the functions $m(x) = \sqrt[3]{x+1}$ and $n(x) = (x-1)^3$ inverses?

3. Write an equation for the inverse function.

(a) $f(x) = 2x^3 - 5$

(b) $g(x) = \frac{2}{x+7}$

4. Sketch a graph of the function $f(x) = \left(\frac{10}{3}\right)^x$.
5. What are the transformations we should apply to the graph of $y = 3^x$ to get a graph of $y = -3^x + 1$.
(Note that order is going to be important here so make sure to check you got that right.)

6. The population of Canada in 2010 was approximately 34 million with an annual growth rate of 0.804%. At this rate, the population $P(t)$ (in millions) can be approximated by

$$P(t) = 34(1.00804)^t$$

where t is the time in years since 2010.

(a) Is the graph of p increasing or decreasing? Why?

(b) Evaluate $P(0)$ and interpret its meaning in the context of this problem.

(c) Evaluate $P(5)$ and interpret its meaning in the context of this problem. Round the population value to the nearest million.

(d) Evaluate $P(13)$ then check online for the actual current population of Canada. How accurate is this model?

7. Write in exponential form

(a) $\log_b(x^2 + y^2) = 4$

(b) $\ln x = c + d$

8. Write in logarithmic form

(a) $10^{xy} = 5c$

(b) $8^{-1/3} = \frac{1}{2}$

9. Let $h(x) = \log(x - 3)$.

(a) Write the domain in interval notation.

(b) Write the range in interval notation.

(c) Write an equation for the vertical asymptote.

(d) Sketch a graph of the function.

10. Let $h(x) = 2 + \ln(x)$.

(a) Write the domain in interval notation.

(b) Write the range in interval notation.

(c) Write an equation for the vertical asymptote.

(d) Sketch a graph of the function.

11. Expand and simplify

(a) $\log_2 \left(\frac{1}{8} a^2 b \right)$

(b) $\log \left(\frac{x^2(2x+1)^5}{\sqrt{1-x}} \right)$

12. If $\ln(a) = 5$, $\ln(b) = 2$, and $\ln(c) = 7$, compute $\ln \left(\frac{\sqrt[3]{ab^2}}{c^3} \right)$.

13. Write as a single logarithm

(a) $4 \log_5(y) - 3 \log_3(x) + \frac{1}{2} \log_5(z)$

(b) $\log(250) + \log(2) - \log(5)$

(c) $\frac{1}{4} \ln(x^2 - 9) - \frac{1}{4} \ln(x - 3)$

14. Write $\log \left(xy^2 \sqrt{x^3 y^4 \sqrt{x^5 y^6}} \right)$ as $A \log(x) + B \log(y)$.

15. Solve the equation

(a) $1000^{2x+1} = \left(\frac{1}{100}\right)^{x-4}$

(b) $2^{c+3} = 7^{2c+5}$

(c) $2(10^{1.2t}) = 58$

(d) $\log_5(4p + 7) = \log_5(2 - p)$

(e) $2\log_6(4 - 8y) + 6 = 10$

(f) $\ln x + \ln(x + 2) = \ln(x + 6)$

16. Suppose that \$50,000 is invested in an account that earns 7% interest per year compounded monthly.
- (a) What is the account balance after 5 years?
 - (b) How many years will it take for the account balance to reach \$75,000?
17. Caffeine occurs naturally in a variety of food products such as coffee, tea, and chocolate. The kidneys filter the blood and remove caffeine. The biological half-life of caffeine is approximately 6 hr.
- (a) If we drink a cup of coffee with 80 mg of caffeine, how long will it take for the amount of caffeine to drop below 60 mg? Round to 1 decimal place.
 - (b) Laura has trouble sleeping if she has more than 30 mg of caffeine in her bloodstream. How many hours after drinking coffee would Laura have to wait so that the coffee would not disrupt her sleep? Round to 1 decimal place.

18. The population of a certain region is growing exponentially. There were 35 million people on January 1, 1980 and 80 million people on January 1, 1990.

(a) Find an exponential growth model for the population (in millions of people) at any time t in years after 1980.

(b) What population do you predict for the year 2000?

(c) How many years does it take for the population to double?

19. For each Section in Chapter 4, write down the key terms and ideas.

(a) Section 4.1:

(b) Section 4.2:

(c) Section 4.3:

(d) Section 4.4:

(e) Section 4.5:

(f) Section 4.6: