

Chapter 10 Review

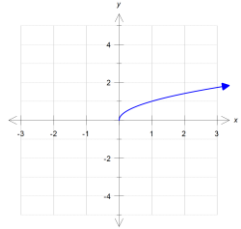
1. For $f(x) = x^2 - 3$ and $g(x) = x - 5$, find:

a. $(f \circ g)(2)$ b. $(g \circ f)(2)$ c. $(f \circ g)(x)$

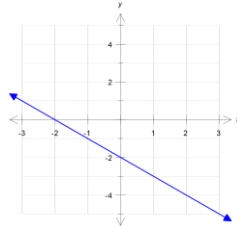
d. $(g \circ f)(x)$

2. Do the following functions have inverses? Explain.

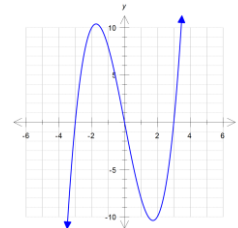
a.



b.



c.



3. Find the inverse of each of the following, if it exists

a. $f(x) = \frac{1}{3}x + 4$

b. $f(x) = x^2 - 6$

c. $f(x) = 2x^3 - 1$

4. Evaluate:

a. $\log_4 16$

b. $\log_b b$

c. $\log_a 1$

d. $\log_8 8^{159}$

5. Rewrite in exponential form:

a. $\log_x 3 = m$

b. $\ln p = q$

6. Rewrite in logarithmic form:

a. $3^4 = 81$

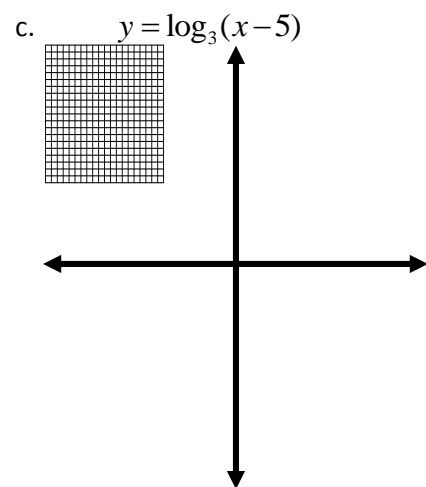
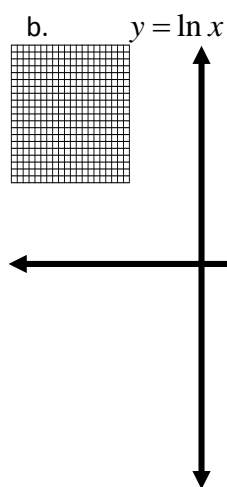
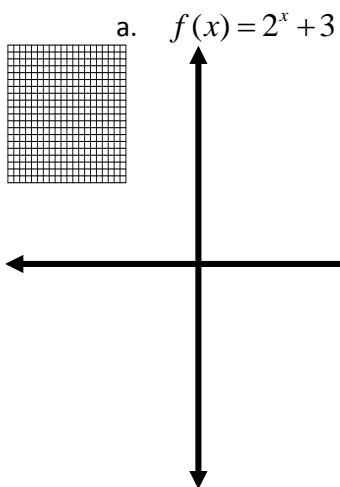
b. $m^n = r$

7. Use a calculator to approximate the following. Round to the nearest thousandth.

a. $\log_2 40$

b. $\log_{1/3} 8$

8. Graph each of the following, and give the domain and range.



9. Solve:

a. $2^{3x} = 16$

b. $3^x = 15$

c. $5e^x + 3 = 7$

d. $\log_x 10 = 3$

e. $4\ln x = 20$

f. $\log(2x - 6) = 2$

10. A laptop computer is purchased for \$1500. Its value each year is about 60% of its value in the preceding year. Its value in dollars after t years is given by the function $V(t) = 1500(0.6)^t$.

a. What is its value after 5 years?

b. After what amount of time will the laptop's value be half the original value?

11. U.S. companies spent \$1.2 billion in e-mail marketing in 2007. This amount was predicted to grow exponentially to \$2.1 billion in 2012.

a. Find the exponential growth rate, k , and write a function of the form $P(t) = P_0 e^{kt}$ that describes the amount (in billions of dollars), spent on marketing t years after 2007.

b. Estimate the amount spent on e-mail marketing in 2014.

c. In what year will U.S. companies spend \$4 billion on e-mail marketing?

d. Find the doubling time.

12. The number of hepatitis A cases in the U.S. has decreased exponentially since 1995. The number of cases for various years are listed in the table below.

a. Use regression to find an exponential function of the form $f(x) = ab^x$ that can be used to estimate the number of hepatitis A cases x years after 1995.

| Year | Cases in Hepatitis A (in thousands) |
|------|-------------------------------------|
| 1995 | 31.6 |
| 2000 | 13.4 |
| 2003 | 7.7 |
| 2004 | 5.7 |
| 2005 | 4.5 |
| 2006 | 3.6 |
| 2007 | 3.0 |

b. Use the function from part (a) to estimate the number of cases of hepatitis A in 2010.

c. When will the number of cases decrease to 1 thousand?

Answers

1. a. 6 b. -4 c. $x^2 - 10x + 22$

d. $x^2 - 8$

2. a. yes b. yes c. no

3. a. $f^{-1}(x) = 3x - 12$ b. no inverse c. $f^{-1}(x) = \sqrt[3]{\frac{x+1}{2}}$

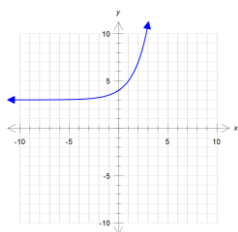
4. a. 2 b. 1 c. 0 d. 159

5. a. $x^m = 3$ b. $e^q = p$

6. a. $\log_3 81 = 4$ b. $\log_m r = n$

7. a. 5.322 b. -1.893

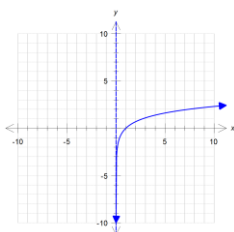
8. a.



domain: $(-\infty, \infty)$

range: $(3, \infty)$

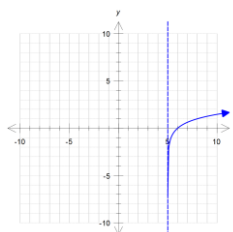
b.



domain: $(0, \infty)$

range: $(-\infty, \infty)$

c.



domain: $(5, \infty)$

range: $(-\infty, \infty)$

9. a. $x = \frac{4}{3}$ b. $x = \frac{\ln 15}{\ln 3}$ c. $x = \ln(4/5)$

d. $x = \sqrt[3]{10}$ e. $x = e^5$ f. $x = 53$

10. a. \$116.64 b. 1.36 years

11. a. $P(t) = 1.2e^{0.112t}$ b. \$2.6 billion c. 2018 d. 6.2 years

12. a. $f(x) = 33.8684(0.8196)^x$

b. 1700 cases c. 17.7 years