Chapter 3 Practice Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

Use the graph of f to describe the transformation that results in the graph of g. Then sketch the graphs of g and f.

1. $f(x) = \left(\dfrac{1}{6}\right)^x$; $g(x) = \left(\dfrac{1}{6}\right)^{x-3} - 2$

   a. $g(x)$ is the graph of $f(x)$ translated 3 unit(s) to the right and 2 unit(s) down.   b. $g(x)$ is the graph of $f(x)$ translated 2 unit(s) to the left and 3 unit(s) down.   c. $g(x)$ is the graph of $f(x)$ translated 2 unit(s) to the right and 3 unit(s) down.   d. $g(x)$ is the graph of $f(x)$ translated 3 unit(s) to the left and 2 unit(s) down.

2. The world's population is expected to grow at a rate of 1.3% per year until at least the year 2020. In 1994 the total population of the world was about 5,642,000,000 people. Use the formula $P_n = P_0 e^{in}$ to predict the world's population P_n, n years after 1994, with P_0 equal to the population in 1994 and i equal to the expected growth rate. What is the world's predicted population in the year 2020, rounded to the nearest million?

   a. 12,632,000,000   b. 7,911,000,000
   c. 7,549,000,000   d. 7,317,000,000

3. If the Laffite family deposits $8500 in a savings account at 6.75% interest, compounded continuously, how much will be in the account after 25 years?

   a. $227,338.93   b. $45,950.57   c. $38,094.36
   d. $38,720.02

   Evaluate each expression.

4. $6^{\log_6 9.2}$

   a. 6   b. 9.2   c. 9.2^6 d. $6^{9.2}$

Short Answer

5. Sketch and analyze the graph of $d(x) = 3^{-x} + 2$. Describe its domain, range, intercepts, asymptotes, end behavior, and where the function is increasing or decreasing.

6. A shipping company owns a fleet of heavy trucks. If the purchase price of each truck is $245,000 and its value depreciates by 15 percent per year, what is the value of each truck after 4 years?

7. Heather invests $500 in an account with a 6% interest rate, making no other deposits or withdrawals. What will Heather's account balance be after 5 years if the interest is compounded 2 times each year?

   Evaluate each expression.

8. $\log_5 5^5$

9. $\log 10^{7.5}$

Expand each expression.

10. $\log_5 \dfrac{4x+6}{\sqrt[4]{4-2x}}$

Condense each expression.

11. $-6\log_5(x+1) + 5\log_5(6x)$

12. $3\log_9 x - \dfrac{1}{5}\log_9(9-x)$

13. $\ln 4 - 8\ln a - 5\ln b - 3\ln c$

Evaluate each logarithm.

14. $\log_6 \sqrt[7]{7776}$

Solve each logarithmic equation.

22. $\ln(x+4) + \ln(3x+3) = \ln 6$

23. $-7 - 16\ln 8x = -30$

24. $12 - 2\log 4x = 3$

Solve the equation or inequality.

25. $\log_4 x = -2$

15. $\log_{\frac{1}{8}}\left(\dfrac{1}{7}\right)$

Solve each equation.

16. $\left(\dfrac{125}{64}\right)^{2x-2} = \left(\dfrac{5}{4}\right)^{3x+1}$

17. $\log_2(7x) = \log_2 9 + \log_2(x-5)$

18. $0.7^x = 7.9$

19. $2^{-5x+3} = 3^{2x+1}$

20. $\log(x+6) = 2 + \log(x+1)$

21. $4e^{4x} + 13e^{2x} = -3$

26. Solve $\log_{16} x = -\dfrac{3}{4}$.

27. Find the amount of time required to double an amount at 3.51 % if the interest is compounded continuously.

28. The table below shows data on the number of mold colonies growing in a culture on a petri dish.

Time (hours)	0	4	8	12	16
Mold Colonies	1	4	12	31	71

a. Find an exponential function that models the data.
b. Write the equation from part a in terms of base *e*.
c. Use the model to estimate the doubling time for the mold culture.

29. Graph the function $f(x) = \left(\dfrac{1}{4}\right)^x$.

Chapter 3 Practice Test
Answer Section

MULTIPLE CHOICE

1. ANS: D

	Feedback
A	The horizontal direction is incorrect.
B	The vertical and horizontal directions are switched.
C	The vertical and horizontal directions are switched.
D	Correct!

PTS: 1   DIF: Average   REF: Lesson 3-1
OBJ: 3-1.1 Evaluate, analyze, and graph exponential functions.
NAT: 2   STA: CLE 3126.3.3 | CLE 3126.3.6 | 3126.3.22 | 3126.1.8 | CLE 3126.2.2 | 3126.2.3
TOP: Exponential Functions   KEY: Exponential | Functions | Graphing | Growth | Decay
NOT: Example 2: Graph Transformations of Exponential Functions

2. ANS: B   PTS: 1   DIF: Average   REF: Lesson 3-1
OBJ: 3-1.2 Solve problems involving exponential growth and decay.
NAT: 2   STA: CLE 3126.3.3 | CLE 3126.3.6 | 3126.3.22 | 3126.1.8 | CLE 3126.2.2 | 3126.2.3
TOP: Exponential Functions   KEY: Exponential Decay
NOT: Example 6: Model Using Exponential Growth or Decay

3. ANS: B   PTS: 1   DIF: Average   REF: Lesson 3-1
OBJ: 3-1.2 Solve problems involving exponential growth and decay.
NAT: 2   STA: CLE 3126.3.3 | CLE 3126.3.6 | 3126.3.22 | 3126.1.8 | CLE 3126.2.2 | 3126.2.3
TOP: Exponential Functions   KEY: Exponential Decay
NOT: Example 5: Use Continuous Compound Interest

4. ANS: B

	Feedback
A	The value of the logarithm is not 1.
B	Correct!
C	Remember, the logarithm means $6^x = 9.2$.
D	Remember, the logarithm means $6^x = 9.2$.

PTS: 1   DIF: Average   REF: Lesson 3-2
OBJ: 3-2.1 Evaluate expressions involving logarithms.   NAT: 2
STA: CLE 3126.3.3 | 3126.3.4 | 3126.3.20 | 3126.3.22 | CLE 3126.1.4 | 3126.1.6 | CLE 3126.2.1 | CLE 3126.2.2 |
3126.2.3   TOP: Logarithmic Functions
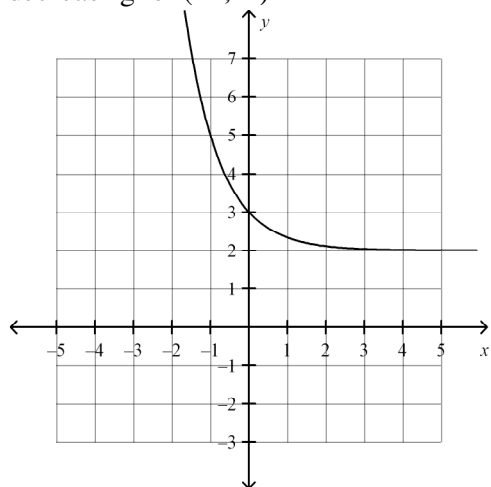KEY: Logarithms | Functions | Graphing | Evaluate
NOT: Example 2: Apply Properties of Logarithms

SHORT ANSWER

5. ANS:
   D = (-∞, ∞)
   R = (2, ∞)
   intercept: (0, 3)
   asymptote: $y = 2$
   as $x \to -\infty$, $f(x) \to \infty$; as $x \to \infty$, $f(x) \to 2$
   decreasing for (-∞, ∞)

   PTS: 1   DIF: Average   REF: Lesson 3-1
   OBJ: 3-1.1 Evaluate, analyze, and graph exponential functions.
   NAT: 2   STA: CLE 3126.3.3 | CLE 3126.3.6 | 3126.3.22 | 3126.1.8 | CLE 3126.2.2 | 3126.2.3
   TOP: Exponential Functions   KEY: Exponential | Functions | Graphing | Growth | Decay
   NOT: Example 1: Sketch and Analyze Graphs of Exponential Functions

6. ANS:
   $127,891.53

   PTS: 1   DIF: Average   REF: Lesson 3-1
   OBJ: 3-1.2 Solve problems involving exponential growth and decay.
   NAT: 2   STA: CLE 3126.3.3 | CLE 3126.3.6 | 3126.3.22 | 3126.1.8 | CLE 3126.2.2 | 3126.2.3
   TOP: Exponential Functions   KEY: Solve Problems | Exponential Growth | Exponential Decay
   NOT: Example 6: Model Using Exponential Growth or Decay

7. ANS:
   $671.96

   PTS: 1   DIF: Average   REF: Lesson 3-1
   OBJ: 3-1.2 Solve problems involving exponential growth and decay.
   NAT: 2   STA: CLE 3126.3.3 | CLE 3126.3.6 | 3126.3.22 | 3126.1.8 | CLE 3126.2.2 | 3126.2.3
   TOP: Exponential Functions   KEY: Exponential | Functions | Graphing | Growth | Decay
   NOT: Example 4: Use Compound Interest

8. ANS:
5

PTS: 1　　　DIF: Average　　REF: Lesson 3-2
OBJ: 3-2.1 Evaluate expressions involving logarithms.　　NAT: 2
STA: CLE 3126.3.3 | 3126.3.4 | 3126.3.20 | 3126.3.22 | CLE 3126.1.4 | 3126.1.6 | CLE 3126.2.1 | CLE 3126.2.2 |
3126.2.3　　TOP: Logarithmic Functions
KEY: Logarithms | Functions | Graphing | Evaluate　　NOT: Example 1: Evaluate Logarithms

9. ANS:
7.5

PTS: 1　　　DIF: Average　　REF: Lesson 3-2
OBJ: 3-2.1 Evaluate expressions involving logarithms.　　NAT: 2
STA: CLE 3126.3.3 | 3126.3.4 | 3126.3.20 | 3126.3.22 | CLE 3126.1.4 | 3126.1.6 | CLE 3126.2.1 | CLE 3126.2.2 |
3126.2.3　　TOP: Logarithmic Functions
KEY: Logarithms | Functions | Graphing | Evaluate　　NOT: Example 1: Evaluate Logarithms

10. ANS:

$$\log_5 (4x + 6) - \frac{1}{4} (4 - 2x)$$

PTS: 1　　　DIF: Average　　REF: Lesson 3-3　　OBJ: 3-3.1 Apply properties of logarithms.
NAT: 2
STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | CLE 3126.1.3 | CLE 3126.1.6 | 3126.1.5 | 3126.2.3
TOP: Properties of Logarithms　　KEY: Logarithm Properties | Change of Base
NOT: Example 1: Use the Properties of Logarithms

11. ANS:

$$\log_5 \frac{7776x^5}{(x+1)^6}$$

PTS: 1　　　DIF: Average　　REF: Lesson 3-3　　OBJ: 3-3.1 Apply properties of logarithms.
NAT: 2
STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | CLE 3126.1.3 | CLE 3126.1.6 | 3126.1.5 | 3126.2.3
TOP: Properties of Logarithms　　KEY: Logarithm Properties | Change of Base
NOT: Example 1: Use the Properties of Logarithms

12. ANS:

$$\log_9 \frac{x^3}{\sqrt[5]{9-x}}$$

PTS: 1　　　DIF: Average　　REF: Lesson 3-3　　OBJ: 3-3.1 Apply properties of logarithms.
NAT: 2
STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | CLE 3126.1.3 | CLE 3126.1.6 | 3126.1.5 | 3126.2.3
TOP: Properties of Logarithms　　KEY: Logarithm Properties | Change of Base
NOT: Example 1: Use the Properties of Logarithms

13. ANS:
    $\ln 4a^{-8}b^{-5}c^{-3}$

    PTS: 1   DIF: Average   REF: Lesson 3-3   OBJ: 3-3.1 Apply properties of logarithms.
    NAT: 2
    STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | CLE 3126.1.3 | CLE 3126.1.6 | 3126.1.5 | 3126.2.3
    TOP: Properties of Logarithms   KEY: Logarithm Properties | Change of Base
    NOT: Example 1: Use the Properties of Logarithms
14. ANS:
    $\dfrac{5}{7}$

    PTS: 1   DIF: Average   REF: Lesson 3-3
    OBJ: 3-3.2 Apply the Change of Base Formula.   NAT: 2
    STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | CLE 3126.1.3 | CLE 3126.1.6 | 3126.1.5 | 3126.2.3
    TOP: Properties of Logarithms   KEY: Logarithm Properties | Change of Base
    NOT: Example 2: Simplify Logarithms
15. ANS:
    1.069

    PTS: 1   DIF: Average   REF: Lesson 3-3
    OBJ: 3-3.2 Apply the Change of Base Formula.   NAT: 2
    STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | CLE 3126.1.3 | CLE 3126.1.6 | 3126.1.5 | 3126.2.3
    TOP: Properties of Logarithms   KEY: Logarithm Properties | Change of Base
    NOT: Example 2: Simplify Logarithms
16. ANS:
    –0.71

    PTS: 1   DIF: Average   REF: Lesson 3-4
    OBJ: 3-4.1 Apply the One-to-One Property of Exponential Functions to solve equations.
    NAT: 2   STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
    TOP: Exponential and Logarithmic Equations
    KEY: Equations | Exponential | Logarithms | One-to-One
    NOT: Example 1: Solve Exponential Equations Using One-to-One Property
17. ANS:
    22.5

    PTS: 1   DIF: Average   REF: Lesson 3-4
    OBJ: 3-4.2 Apply the One-to-One Property of Logarithmic Functions to solve equations.
    NAT: 2   STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
    TOP: Exponential and Logarithmic Equations
    KEY: Equations | Exponential | Logarithms | One-to-One
    NOT: Example 2: Solve Logarithmic Equations Using One-to-One Property

18. ANS:
    −5.79

    PTS: 1   DIF: Average   REF: Lesson 3-4
    OBJ: 3-4.1 Apply the One-to-One Property of Exponential Functions to solve equations.
    NAT: 2   STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
    TOP: Exponential and Logarithmic Equations
    KEY: Equations | Exponential | Logarithms | One-to-One
    NOT: Example 1: Solve Exponential Equations Using One-to-One Property

19. ANS:
    0.17

    PTS: 1   DIF: Average   REF: Lesson 3-4
    OBJ: 3-4.1 Apply the One-to-One Property of Exponential Functions to solve equations.
    NAT: 2   STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
    TOP: Exponential and Logarithmic Equations
    KEY: Equations | Exponential | Logarithms | One-to-One
    NOT: Example 1: Solve Exponential Equations Using One-to-One Property

20. ANS:
    −0.95

    PTS: 1   DIF: Average   REF: Lesson 3-4
    OBJ: 3-4.2 Apply the One-to-One Property of Logarithmic Functions to solve equations.
    NAT: 2   STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
    TOP: Exponential and Logarithmic Equations
    KEY: Equations | Exponential | Logarithms | One-to-One
    NOT: Example 2: Solve Logarithmic Equations Using One-to-One Property

21. ANS:
    $(-0.25, -3)$

    PTS: 1   DIF: Average   REF: Lesson 3-4
    OBJ: 3-4.1 Apply the One-to-One Property of Exponential Functions to solve equations.
    NAT: 2   STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
    TOP: Exponential and Logarithmic Equations
    KEY: Equations | Exponential | Logarithms | One-to-One
    NOT: Example 1: Solve Exponential Equations Using One-to-One Property

22. ANS:
    −0.44

    PTS: 1   DIF: Average   REF: Lesson 3-4
    OBJ: 3-4.2 Apply the One-to-One Property of Logarithmic Functions to solve equations.
    NAT: 2   STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
    TOP: Exponential and Logarithmic Equations
    KEY: Equations | Exponential | Logarithms | One-to-One
    NOT: Example 2: Solve Logarithmic Equations Using One-to-One Property

23. ANS:
0.53

PTS: 1 DIF: Average REF: Lesson 3-4
OBJ: 3-4.2 Apply the One-to-One Property of Logarithmic Functions to solve equations.
NAT: 2 STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
TOP: Exponential and Logarithmic Equations
KEY: Equations | Exponential | Logarithms | One-to-One
NOT: Example 2: Solve Logarithmic Equations Using One-to-One Property

24. ANS:
7905.69

PTS: 1 DIF: Average REF: Lesson 3-4
OBJ: 3-4.2 Apply the One-to-One Property of Logarithmic Functions to solve equations.
NAT: 2 STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
TOP: Exponential and Logarithmic Equations
KEY: Equations | Exponential | Logarithms | One-to-One
NOT: Example 2: Solve Logarithmic Equations Using One-to-One Property

25. ANS:
0.06

PTS: 1 DIF: Average REF: Lesson 3-4
OBJ: 3-4.2 Apply the One-to-One Property of Logarithmic Functions to solve equations.
NAT: 2 STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
TOP: Exponential and Logarithmic Equations
KEY: Solve Equations | Solve Inequalities | Common Logarithms
NOT: Example 2: Solve Logarithmic Equations Using One-to-One Property

26. ANS:
$\dfrac{1}{8}$

PTS: 1 DIF: Average REF: Lesson 3-4
OBJ: 3-4.2 Apply the One-to-One Property of Logarithmic Functions to solve equations.
NAT: 2 STA: CLE 3126.3.5 | CLE 3126.3.6 | 3126.3.21 | CLE 3126.1.2 | 3126.1.4
TOP: Exponential and Logarithmic Equations KEY: Solve Equations | Logarithms
NOT: Example 2: Solve Logarithmic Equations Using One-to-One Property

27. ANS:
19.75 years

PTS: 1 DIF: Average REF: Lesson 3-4
OBJ: 3-5.1 Model data using exponential, logarithmic, and logistic functions.
NAT: 2
STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | 3126.5.7 | CLE 3126.1.5 | CLE 3126.1.7 | 3126.1.4 | 3126.1.6 |
3126.1.7 | 3126.1.8 | CLE 3126.2.1 | 3126.2.1 TOP: Modeling with Nonlinear Regression
KEY: Exponential Inequalities | Doubling Time NOT: Example 4: Solve Exponential Equations

28. ANS:
    a. $y = 1.22 \times (1.303)^x$
    b. $y = 1.22e^{0.264x}$
    c. 1.87 hours

    PTS: 1   DIF: Average   REF: Lesson 3-5
    OBJ: 3-5.1 Model data using exponential, logarithmic, and logistic functions.
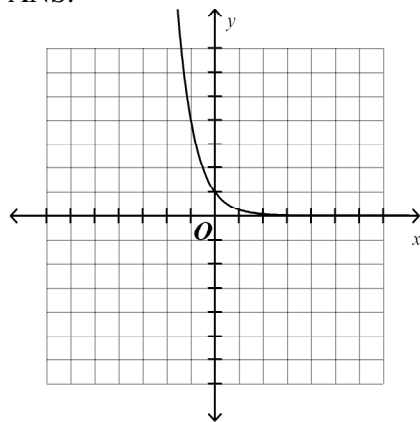   NAT: 2
    STA: CLE 3126.5.2 | 3126.5.3 | 3126.5.6 | 3126.5.7 | CLE 3126.1.5 | CLE 3126.1.7 | 3126.1.4 | 3126.1.6 |
    3126.1.7 | 3126.1.8 | CLE 3126.2.1 | 3126.2.1   TOP: Modeling with Nonlinear Regression
    KEY: Exponential Functions | Logarithmic Functions | Model Real-World Data
    NOT: Example 1: Exponential Regression

29. ANS:

    Example 1

    PTS: 1   DIF: Average   REF: Lesson 3-1
    OBJ: 3-1.1 Evaluate, analyze, and graph exponential functions.
    NAT: 2   STA: CLE 3126.3.3 | CLE 3126.3.6 | 3126.3.22 | 3126.1.8 | CLE 3126.2.2 | 3126.2.3
    TOP: Exponential Functions   KEY: Graph Functions | Exponential Functions
    NOT: Example 1: Sketch and Analyze Graphs of Exponential Functions