1. A culture of bacteria doubles every hour. If there are 500 bacteria at the beginning, how many bacteria will there be after 9 hours?

a)	A. 256,000	c) 9,000
b)	4,500	d) 40,500

Given the function f(x) = 630(0.64)^x, determine if this function models exponential growth or decay and identify the growth or decay rate.

a)	Decay, 64%	c) Growth, 64%
b)	Decay, 36%	d) Growth, 36%

- 3. The value (in millions of dollars) of a large company is modeled by $f(x) = 241 (1.04)^x$. What is the projected annual <u>percent of</u> <u>growth</u> and what is the initial value?
 - a) 10.4%; \$241 million
 - b) 2.41%; \$104 million
 - c) 241%; \$4 million
 - d) 4%; \$241 million
- -----
- 4. The recursive formula for a geometric sequence is given as: $a_n = (0.6) a_{n-1}$

 $a_1 = 100$

What is the explicit formula for the same sequence?

a) $a_n = 100 (0.6)^{n-1}$ c) $a_n = 0.6 (100)^{n-1}$ b) $a_n = 100 (0.6)^n$ d) $a_n = 0.6 (100)^n$

5. Write an explicit rule for the following sequence 32, 16, 8, 4, ... (*Hint:* $a_n = a_1(r)^{n-1}$)

a) $a_n = 32(0.5)^{n \cdot 1}$ c) $a_n = 32(-2)^{n \cdot 1}$ b) $a_n = 32(2)^{n \cdot 1}$ d) $a_n = 32(0.25)^{n \cdot 1}$

6. What is the asymptote of the function: $f(x) = (1/3)^x - 2?$

a) y = 2	c) y = -2
b) x = 0	d) x =1/3

7. Which of the following equations represents a reflection over the x-axis, horizontal shift left 4 units, vertical shift up 8 units, and a shrink from the parent function $f(x) = 2^{x}$?

a)
$$f(x) = 2^{x-4} - 8$$

b) $f(x) = -3/4$ (2) $^{x-4} + 8$
c) $f(x) = -3/4$ (2) $^{x+4} + 8$
d) $f(x) = -5(2)^{x+4} + 8$

An	exponential decay
fund	ction that has been
refl	ected over the <i>x</i> -axis
and	shifted up 2 units.

8.



Which function has no x- intercepts and why?

- a) Function 1, it has been shifted up 2 units, and therefore, will not cross the *x*-axis.
- b) Function 1, it has been reflected across the *x*-axis, and therefore, will not cross the *x*-axis.
- c) Function 2 because the *x*-axis is a horizontal asymptote.
- d) Function 2 because the *y*-axis is a horizontal asymptote.

9. Given $f(x) = 3^x$ and $g(x) = -2(3)^x + 4$, describe the transformations performed on f(x) to get g(x).

- a) Vertical Shrink by a factor of -2, Vertical Shift up 4
- b) Reflection over the x-axis, Vertical Stretch by a factor of 2, Vertical Shift up 4

c) Reflection over the x-axis, Vertical Stretch by a factor of 2, Vertical Shift down 4

d) Reflection over the x-axis, Vertical Shrink by a factor of ½, Vertical Shift up 4

10. What is the *y*-intercept of the function whose equation is $y = 2(3)^{x}$?

a) 1	c) 6
b) 3	d) 2



11. What is the average rate of change of f(x) on the interval [-3, -1]?

12. State the range for the function.



13. Determine the function represented by the graph.



14. Which statement correctly describes part of the end behavior of the function graphed?



- a) As $x \to \infty$, $y \to \infty$
- b) As $x \to -\infty$, $y \to 0$
- c) As $x \to \infty$, $y \to 0$
- d) As $x \to -\infty$, $y \to -\infty$

15. Determine which function represented above has a greater average rate of change on the interval from 0 to 2, inclusive.



- a) f(x)
- *b)* g(x)
- c) They have the same rate of change.
- d) It is impossible to compare their rates of change.

16. A certain population of bacteria has an average growth rate of 2%. The formula for the growth of the bacteria's population is $A = P_o * 1.02^t$ where P_o is the original population and t is the time in hours.

If you begin with 200 bacteria, about how many bacteria will there be after 100 hours?

- a) 7 b) 272
- c) 1449
- d) 1478

17.Which function represents this sequence?

п	1	2	3	4	5	
a	6	18	54	162	486	

a)
$$f(n) = 3^{n-1}$$

- b) $f(n) = 6^{n-1}$
- c) $f(n) = 3(6)^{n-1}$
- d) $f(n) = 6(3)^{n-1}$

Unit 4 Milestone Review

18. The points (0, 1), (1, 5), (2, 25) and (3, 125) are on the graph of a function. Which equation represents that function?

a)
$$f(x) = 2^x$$
 c) $f(x) = 4^x$
b) $f(x) = 3^x$ d) $f(x) = 5^x$

19. Which functions show the function $f(x) = 3^x$ being translated 5 units down?

a)
$$f(x) = 3^{x} - 5$$
 c) $f(x) = 3^{x-5}$
b) $f(x) = 3^{x+5}$ d) $f(x) = 3^{x} + 5$

20. Which function shows the function $f(x) = 3^x$ being translated 5 units to the left?

a)
$$f(x) = 3^{x} - 5$$
 c) $f(x) = 3^{x-5}$
b) $f(x) = 3^{x+5}$ d) $f(x) = 3^{x} + 5$

21. Consider the pattern.



Which function represents the sequence that represents the pattern?

a) $a_n = 4^{n-1}$ c) $a_n = a_n * 4^{n-1}$ b) $a_n = 4^{a_n - 1}$ d) $a_n = (a_n)^4$

22. Which function is modeled in this table?

x	f(x)
1	1000
2	800
3	640
4	512

- a) f(x) = 1000(0.80)
- b) f(x) = 1000(0.20)
- c) $f(x) = 1000(0.80)^{x-1}$

d)
$$f(x) = 1000(0.20)^{x-1}$$

23. Which explicit formula describes the patter in this table?

d	С
0	1
1	6
2	36
3	216

a)
$$C = 6d$$

b) $C = d + 6$
c) $C = 6^{d}$
d) $C = d^{6}$

24. If $f(12) = 100(0.50)^{12}$, which expression gives f(x)?

a)
$$f(x) = 12^x$$

b) $f(x) = 100^x$

c) $f(x) = 100(x)^{12}$

d)
$$f(x) = 100(0.50)^x$$

25. Which function is modeled in this table?

x	f(x)	
1	8	
2	40	
3	200	
4	1,000	

a)
$$f(x)=x+7$$

b) $f(x)=5x+8$

c)
$$f(x) = 8^x$$

c) $f(x) = 8^{x}$ d) $f(x) = \frac{8}{5}(5)^{x}$

26. Which table represents an exponential function?

-						
А.	x	0	1	2	3	4
	У	5	6	7	8	9
в.	x	0	1	2	3	4
	у	0	22	44	66	88
C.	x	0	1	2	3	4
	у	5	13	21	29	37
D.	x	0	1	2	3	4
	у	0	3	9	27	81

27. A population of squirrels doubles every year. initially, there were 5 squirrels. A biologist studying squirrels created a function to meld their population growth: $P(t) = 5(2^t)$, where t is the time in years. The graph of the function is shown.



What is the range of the function?

- a) Any real number
- b) Any whole number greater than 0
- c) Any whole number greater than 5
- d) Any whole number greater than or equal to 5

28. A sample of 1000 bacteria becomes infected with a virus. Each day, one fourth of the bacteria sample dies due to the virus. A biologist studying the bacteria models the population of the bacteria with the function $P(t) = 1000(0.75)^t$, where t is the time in days.

What is the range of this function in this context?

- a) Any real number such that $t \ge 0$.
- b) Any whole number such that $t \ge 0$.
- c) Any real number such that $0 \le P(t) \le 1000$.
- d) Any whole number such that $0 \le P(t) \le 1000$.

29. Look at the graph. Which equation represents this graph?



30. The function graphed on this coordinate gird shows f(x), the height of a dropped ball in feet after its xth bounce.



On which bounce was the height of the ball 10 feet?

- a) Bounce 1
- b) Bounce 2
- c) Bounce 3
- d) Bounce 4

31. Which statement is true about graphs of exponential functions?

- a) The graphs of exponential functions never exceed the graphs of linear and quadratic functions.
- b) The graphs of exponential functions always exceed the graphs of linear and quadratic functions.
- c) The graphs of exponential functions eventually exceed the graphs of linear and quadratic functions.
- d) The graphs of exponential functions eventually exceed the graphs of linear but not quadratic functions.

32. Which scatter plot BEST represents a model of exponential growth?



Unit 4 Milestone Review

33. A table of values is shown for f(x) and g(x).

x	f(x)
0	0
1	1
2	4
3	9
4	16
5	25



Which statement compares the graphs of f(x) and g(x)over the interval [0, 5]?

- a) The graph of f(x) always exceeds the graph of g(x)over the interval of [0, 5].
- b) The graph of g(x) always exceeds the graph of f(x)over the interval [0, 5].
- c) The graph of g(x) exceeds the graph of f(x) over the interval [0, 4], the graphs intersect at a point between 4 and 5, and then the graph of f(x)exceeds the graph of g(x).
- d) The graph of f(x) exceeds the graph of g(X) over the interval [0, 4], the graphs intersect at a point between 4 and 5, and then the graph of g(x)exceeds the graph of f(x).

34. Which statement BEST describes the comparison of the function values for f(x) and g(x)?

X	f(x)	g(x)
0	0	-10
1	2	-9
2	4	-6
3	6	-1
4	8	6

- a) The values of f(x) will always exceed the values of g(x).
- b) The values of g(x) will always exceed the values of f(x).
- c) The values of f(x) exceed the values of g(x) over the interval [0,5].
- d) The values of g(x) begin to exceed the values of f(x) within the interval [4,5].

35. Does the data in the table represent a linear, quadratic, exponential or other type of function?

a) Linear

b)

c)

Quadratic Exponential

Y

d) Other

0
2
4
6
8
6 8

f(x)