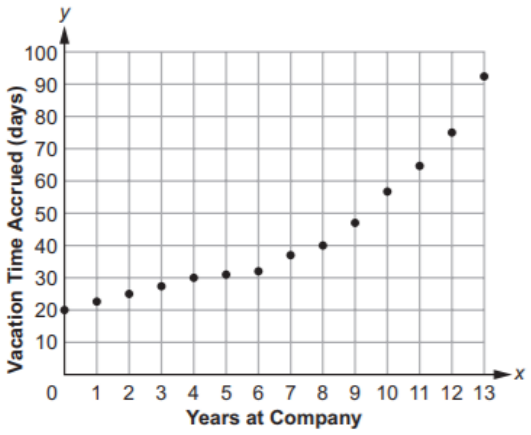
Unit 5: Comparing and Contrasting Functions

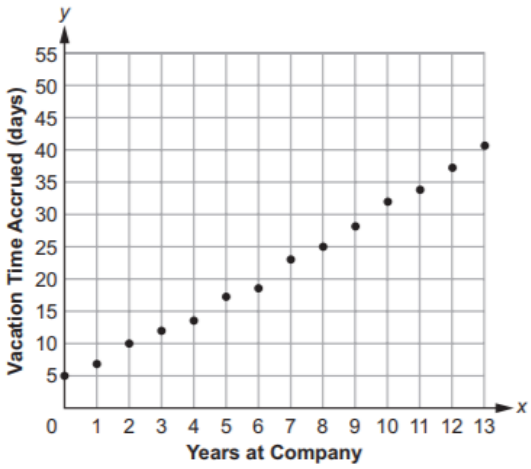
5.1 Construct and Compare Linear, Quadratic, and Exponential Models and Solve Problems

1. Which scatter plot BEST represents a model of linear growth?

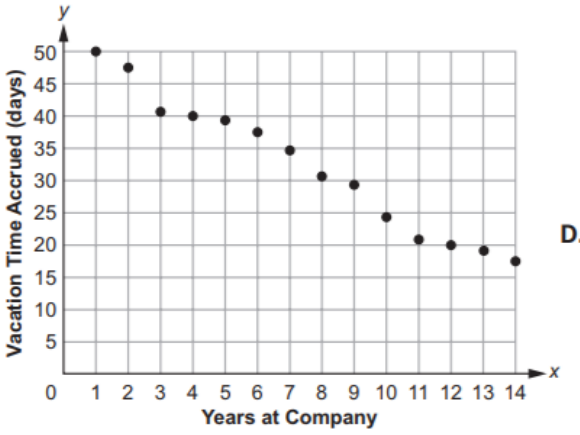
A.



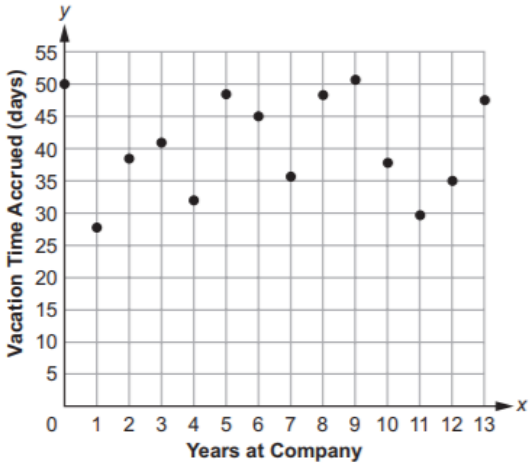
B.



C.

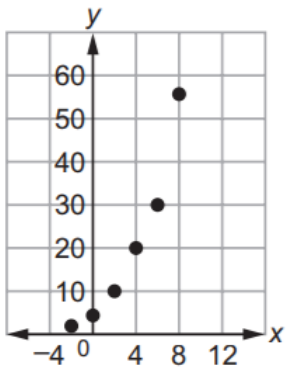


D.

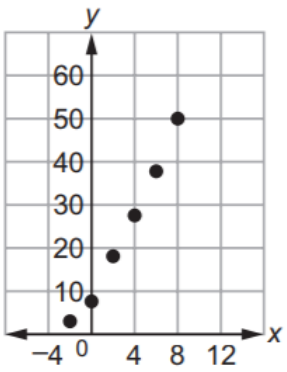


2. Which scatter plot BEST represents a model of exponential growth?

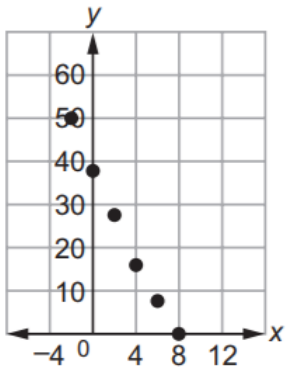
A.



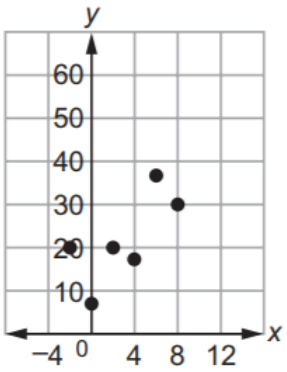
B.



C.



D.



3. Which table represents an exponential function?

A.

x	0	1	2	3	4
y	5	6	7	8	9

B.

x	0	1	2	3	4
y	22	44	66	88	110

C.

x	0	1	2	3	4
y	5	13	21	29	37

D.

x	0	1	2	3	4
y	3	9	27	81	243

4. 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

x	$g(x)$
0	–2
1	–1
2	1
3	5
4	13
5	29

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 [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 $f(x)$.

5. Which statement is true about the 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 functions but not quadratic functions.

6. 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].

Answers to Unit 5.1 Sample Items

1. B 2. A 3. D 4. D 5. C 6. D

5.2 Interpret Expressions for Functions in Terms of the Situation They Model

1. **If the parent function is $f(x) = mx + b$, what is the value of the parameter m for the line passing through the points (–2, 7) and (4, 3)?**

   A. –9

   B. $-\frac{3}{2}$

   C. –2

   D. $-\frac{2}{3}$

2. **Consider this function for cell duplication. The cells duplicate every minute.**

   $$f(x) = 75(2)^x$$

   A. The 75 is the initial number of cells, and the 2 indicates that the number of cells doubles every minute.
   B. The 75 is the initial number of cells, and the 2 indicates that the number of cells increases by 2 every minute.
   C. The 75 is the number of cells at 1 minute, and the 2 indicates that the number of cells doubles every minute.
   D. The 75 is the number of cells at 1 minute, and the 2 indicates that the number of cells increases by 2 every minute.

Answers to Unit 5.2 Sample Items

1. D 2. A

5.3 Build New Functions from Existing Functions

1. **What is the y-intercept of the graph of $h(x) = 2^x - 4$?**

   A. (0, –4)
   B. (0, –3)
   C. (0, 1)
   D. (0, 2)

2. **What is the range of the graph of $f(x) = -3(x - 4)$?**

   A. (–3, 4)
   B. (–3, ∞)
   C. (–∞, 4)
   D. (–∞, ∞)

Answers to Unit 5.3 Sample Items

1. B 2. D

5.4 Understand the Concept of a Function and Use Function Notation

1. 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. $f(x) = (8)^x$

D. $f(x) = \frac{8}{5}(5)^x$

2. If $f(12) = 4(12) - 20$, which function gives $f(x)$?

A. $f(x) = 4x^2 - 20$
B. $f(x) = 4^x - 20$
C. $f(x) = 4x - 20$
D. $f(x) = 4x^2 + 12x - 20$

3. Which function has a range of $f(x) \leq \frac{3}{4}$?

A. $f(x) = \frac{3}{4}x + 5$

B. $f(x) = -x^2 + \frac{3}{4}$

C. $f(x) = x^2 - \frac{3}{4}$

D. $f(x) = \frac{3}{4} - 5x$

Answers to Unit 5.4 Sample Items

1. D 2. C 3. B

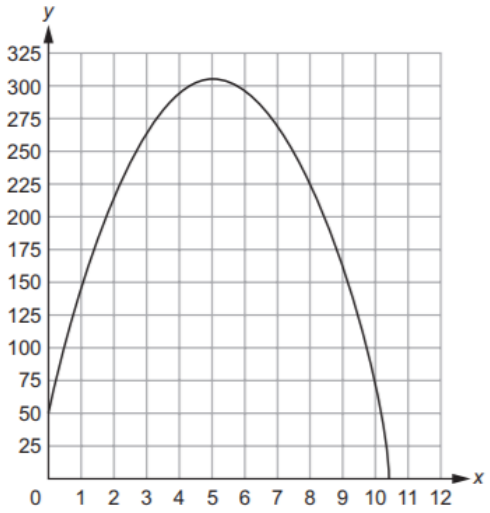
5.5 Interpret Functions That Arise in Applications in Terms of the Context

1. **A sample of 1,000 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 $P(t) = 1{,}000(0.75)^t$, where t is the time, in days.**

   What is the range of this function in this context?

   A. any real number such that $t \geq 0$
   B. any whole number such that $t \geq 0$
   C. any real number such that $0 \leq P(t) \leq 1{,}000$
   D. any whole number such that $0 < P(t) \leq 1{,}000$

2. **The graph shows the height, y, in meters, of a rocket above sea level in terms of the time, t, in seconds, since it was launched. The rocket landed at sea level.**



   What does the x-intercept represent in this situation?

   A. the height from which the rocket was launched
   B. the time it took the rocket to return to sea level
   C. the total distance the rocket flew while it was in flight
   D. the time it took the rocket to reach the highest point in its flight

Answers to Unit 5.5 Sample Items

1. D 2. B