

Coordinate Algebra

1. The first term in this sequence is -1.

|       |    |   |   |   |   |     |
|-------|----|---|---|---|---|-----|
| $n$   | 1  | 2 | 3 | 4 | 5 | ... |
| $a_n$ | -1 | 1 | 3 | 5 | 7 | ... |

Which function represents the sequence?

- A.  $a_n = a_{n-1} + 1$
  - B.  $a_n = a_{n-1} + 2$
  - C.  $a_n = 2a_{n-1} - 1$
  - D.  $a_n = 2a_{n-1} - 3$
2. Which function is modeled in this table?

|     |        |
|-----|--------|
| $x$ | $f(x)$ |
| 1   | 8      |
| 2   | 11     |
| 3   | 14     |
| 4   | 17     |

- A.  $f(x) = 3x + 5$
  - B.  $f(x) = 5x + 3$
  - C.  $f(x) = x + 3$
  - D.  $f(x) = 3x + 8$
3. Which explicit formula describes the pattern in this table?

|     |       |
|-----|-------|
| $d$ | $C$   |
| 2   | 6.28  |
| 3   | 9.42  |
| 5   | 15.70 |
| 10  | 31.40 |

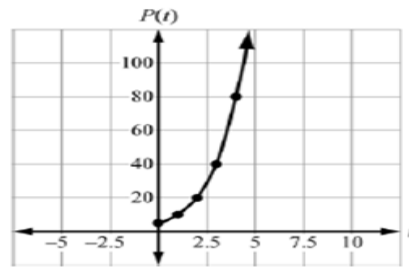
- A.  $d = 3.14 \times C$
  - B.  $3.14 \times C = d$
  - C.  $31.4 \times 10 = C$
  - D.  $C = 3.14 \times d$
4. If  $f(12) = 4(12) - 20$ , which function give  $f(x)$ ?
- A.  $f(x) = 4x$
  - B.  $f(x) = 12x$
  - C.  $f(x) = 4x - 20$
  - D.  $f(x) = 12x - 20$

Unit 3 Test: Linear and Exponential Functions

5. A farmer owns a horse that can continuously run an average of 8 miles an hour for up to 6 hours. Let  $y$  be the distance the horse can travel for a given  $x$  amount of time in hours. The horse's progress can be modeled by a function. Which of the following describes the domain of the function?

- A.  $0 \leq x \leq 6$
- B.  $0 \leq y \leq 6$
- C.  $0 \leq x \leq 48$
- D.  $0 \leq y \leq 48$

6. A population of squirrels doubles every year. Initially there were 5 squirrels. A biologist studying the squirrels created a function to model their population growth.  $P(f) = 5(2^t)$  where  $t$  is the time. The graph of the function is shown. What is the range of the function?

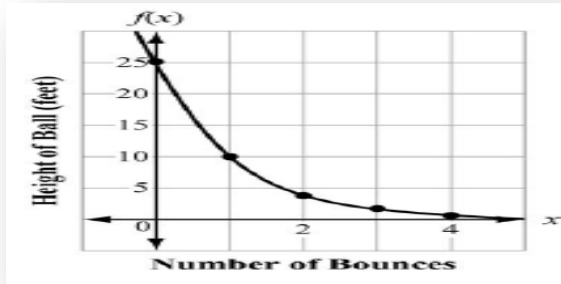


- A. Any real number
  - B. Any whole number greater than 0
  - C. Any whole number greater than 5
  - D. Any whole number greater than or equal to 5
7. The points  $(0,1)$ ,  $(1,5)$ ,  $(2,25)$ ,  $(3,125)$  are on the graph of a function. Which equation represents that function?
- A.  $f(x) = 2^x$
  - B.  $f(x) = 3^x$
  - C.  $f(x) = 4^x$
  - D.  $f(x) = 5^x$

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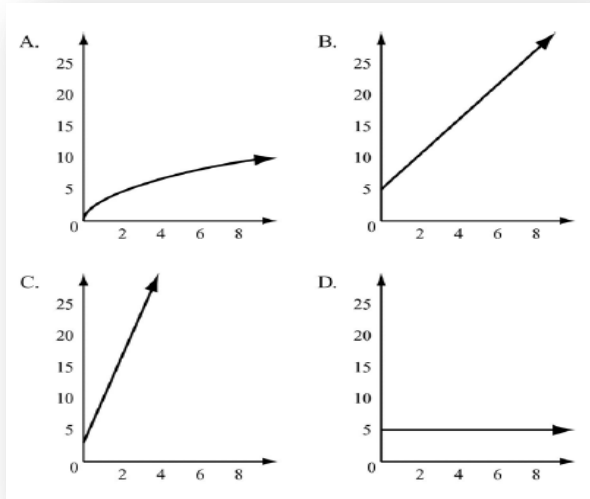
Unit 3 Test: Linear and Exponential Functions

8. The function graphed on this coordinate grid shows  $f(x)$ , the height of a dropped ball in feet after its  $x$ th bounce.



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

- A. Bounce 1
  - B. Bounce 2
  - C. Bounce 3
  - D. Bounce 4
9. To rent a canoe, the cost is \$3 for the oars and life preserver, plus \$5 an hour for the canoe. Which graph models the cost of renting a canoe?



10. Which statement is true about the function  $f(x) = 7^x$ ?

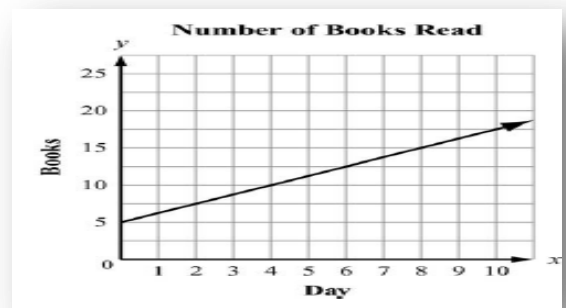
- A. The function is odd because  $-f(x) = f(-x)$
- B. The function is even because  $-f(x) = f(-x)$
- C. The function is odd because  $f(x) = f(-x)$
- D. The function is even because  $f(x) = f(-x)$

11. The first term in this sequence is 3.

|       |   |    |    |    |    |     |
|-------|---|----|----|----|----|-----|
| $n$   | 1 | 2  | 3  | 4  | 5  | ... |
| $a_n$ | 3 | 10 | 17 | 24 | 31 | ... |

Which function represents the sequence?

- A.  $f(n) = n + 3$
  - B.  $f(n) = 7n - 4$
  - C.  $f(n) = 3n + 7$
  - D.  $f(n) = n + 7$
12. Juan and Patti decided to see who could read the most books in a month. They began to keep track after Patti had already read 5 books that month. This graph shows the number of books Patti read for the next 10 days.



If Juan has read no books before the fourth day of the month and he reads at the same rate as Patti, how many books will he have read by day 12?

- A. 5
  - B. 10
  - C. 15
  - D. 20
13. Which function represents this sequence?

|       |   |    |    |     |     |     |
|-------|---|----|----|-----|-----|-----|
| $n$   | 1 | 2  | 3  | 4   | 5   | ... |
| $a_n$ | 6 | 18 | 54 | 162 | 486 | ... |

- A.  $f(n) = 6(3^{n-1})$
- B.  $f(n) = 6^{n-1}$
- C.  $f(n) = 3(6^{n-1})$
- D.  $f(n) = 3^{n-1}$

Coordinate Algebra

Unit 3 Test: Linear and Exponential Functions

14. 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 | 0 | 22 | 44 | 66 | 88 |
- C. 

|   |   |   |   |    |    |
|---|---|---|---|----|----|
| x | 0 | 1 | 2 | 3  | 4  |
| y | 1 | 3 | 9 | 27 | 81 |
- D. 

|   |   |   |   |    |     |
|---|---|---|---|----|-----|
| x | 0 | 1 | 2 | 3  | 4   |
| y | 1 | 2 | 6 | 24 | 120 |

15. A salesperson earns a weekly salary plus a commission on each appliance he sells. The function  $p(x) = 200 + 0.05x$  shows his weekly earnings if  $x$  represents his weekly sales, in dollars. Which is also true?

- A. His weekly salary is \$205.
- B. He earns \$200 for each appliance he sells.
- C. He earns \$0.05 for each appliance he sells.
- D. He earns a 5% commission for each appliance he sells.

16. If  $a_n = a_{n-1} + 4$  and  $a_5 = 12$ , what is  $a_7$ ?

- A. 11
- B. 7
- C. 20
- D. 16

17. Given the equation and table below, which of the following statements is true about the functions  $f(x)$  and  $g(x)$ ?

$$f(x) = \frac{2}{5}x - 3$$

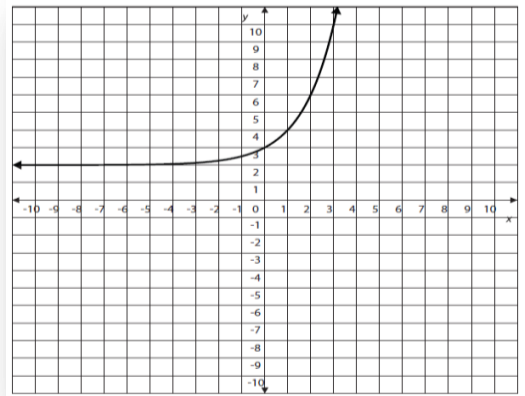
| x  | g(x) |
|----|------|
| -4 | -29  |
| -2 | -17  |
| 2  | 7    |
| 4  | 19   |

- A. The y-intercept of the function  $f(x)$  is less than the y-intercept of the function  $g(x)$ .
- B. The y-intercept of the function  $f(x)$  is greater than the y-intercept of the function  $g(x)$ .
- C. The y-intercept of the function  $f(x)$  is equal to the y-intercept of the function  $g(x)$ .
- D. The y-intercepts cannot be determined.

18. If  $f(x) = 3x - 5$  and the domain of  $f$  is  $\{2, 4, 6\}$ , what is the range of  $f(x)$ ?

- A.  $\{11, 17, 20\}$
- B.  $\{-6, -4, -2\}$
- C.  $\{2, 4, 6\}$
- D.  $\{1, 7, 13\}$

19. Given the graph of  $f(x)$  below, what is  $f(2)$ ?



- A.  $f(2) = 6$
- B.  $f(-5) = 2$
- C.  $f(2) = -5$
- D.  $f(6) = 2$

20. What is the rate of change for the function  $f(x) = 5(2)^{\frac{x}{4}}$  over the interval  $[8, 12]$ ?

- A. 60
- B. 20
- C. 5
- D. The rate of change cannot be determined.

21. The equation  $A(t) = 900(0.85)^t$  represents the value of a motor scooter  $t$  years after it was purchased. Which statement is also true of this situation?

- A. When new, the scooter cost \$765.
- B. When new, the scooter cost \$900.
- C. The scooter's value is decreasing at a rate of 85% each year.
- D. The scooter's value is decreasing at a rate of 0.15% each year.

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Unit 3 Test: Linear and Exponential Functions

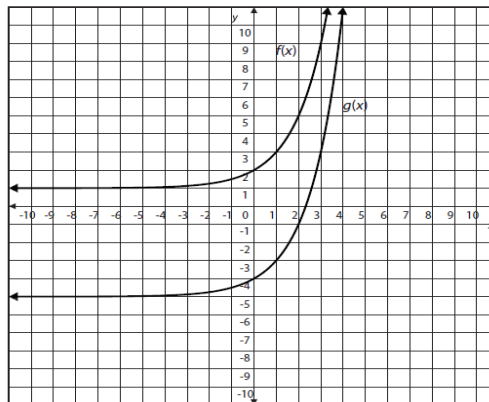
22. If  $f(x) = 2x - 4$  and  $g(x) = 5x + 10$ , what is  $(f + g)(x)$ ?

- A.  $(f + g)(x) = 7x + 6$
- B.  $(f + g)(x) = 7x - 14$
- C.  $(f + g)(x) = 3x + 6$
- D.  $(f + g)(x) = 3x - 14$

23. The explicit formula for a geometric sequence is  $a_n = 3(-2)^{n-1}$ . What is the fifth term of the sequence?

- A. -96
- B. 48
- C. 192
- D. -48

24. Given the graph of  $f(x)$  and  $g(x)$  below, which is the function rule for  $g(x)$  in terms of  $f(x)$ ?



- A.  $g(x) = f(x) + 6$
- B.  $g(x) = f(x) - 4$
- C.  $g(x) = f(x) - 6$
- D.  $g(x) = f(x) + 4$

**Matching:** For numbers 25 – 28. Match each verbal description of a translation of  $f(x) = 4^x$  with the equation of its transformed image by writing the correct letter next to each description.

25. Vertical stretch by a factor of 5

A.  $g(x) = 4^{5x}$

26. Vertical shrink by a factor of  $\frac{1}{5}$

B.  $g(x) = 5(4^x)$

27. Horizontal shrink by a factor of 5

C.  $g(x) = 4^{\left(\frac{1}{5}x\right)}$

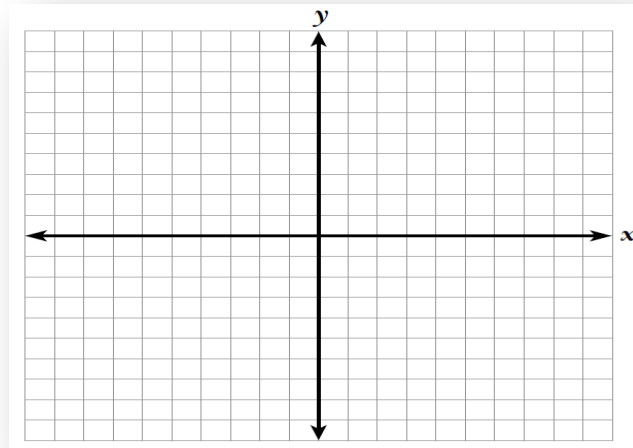
28. Horizontal stretch by a factor of  $\frac{1}{5}$

D.  $g(x) = \frac{1}{5}(4^x)$

**Discussion Questions:** For numbers 29 and 30, please use complete sentences when explaining why and remember to support your answer with mathematical facts about the problem.

29. The starting balance of Adam’s savings account is \$575. Each month, Adam deposits \$60.

- i. Write a function to model this scenario. Be sure to identify what your variables represent in this situation.
- ii. Create a graph to show how much money Adam has in his savings account each month for the first year.



- iii. Identify the key features of the function. Determine the x and y intercepts, the maximum, the minimum, whether the function is increasing or decreasing, and the rate of change of the function.

30. Suppose you start work at \$600 a week. After a year, you are given two choices for getting a raise:

**Option 1:** A 4% increase every year

**Option 2:**

|               |              |              |              |              |              |              |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>Year</b>   | <b>1</b>     | <b>2</b>     | <b>3</b>     | <b>4</b>     | <b>5</b>     | <b>.....</b> |
| <b>Salary</b> | <b>\$600</b> | <b>\$625</b> | <b>\$650</b> | <b>\$675</b> | <b>\$700</b> | <b>.....</b> |

- i. Write a function for each option. Be sure to identify what your variables represent in this situation.
- ii. Assuming you really like your job and plan on staying there for at least 5 years, which option would give you the most money? Why?
- iii. Which option would be best for you if you plan on staying less than 4 years? Why?