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) 256,000
b) 4,500
c) 9,000
d) 40,500

500(2)^9

2. 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.

decay factor = 64%
decay rate: 36%

dec

36%

a) Decay, 64%
b) Decay, 36%
c) Growth, 64%
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 *percent of growth* 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:

$a_n = (0.6)\ a_{n-1}$
$a_1 = 100$

$a_n = a_1(r)^{n-1}$
$100(.6)^{n-1}$

What is the explicit formula for the same sequence?

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

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

Decay ÷2 (·½)
32(½)

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

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

y = 2

a) y = 2
b) x = 0
c) y = -2
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) $f(x) = -5(2)^{x+4} + 8$

8.

| Function 1: | Function 2: |
|---|---|
| An exponential decay function that has been reflected over the $x$-axis and shifted up 2 units. | |

| $x$ | $f(x)$ |
|---|---|
| -2 | 9 |
| -1 | 3 |
| 0 | 1 |
| 1 | 0.3 |

y =
Asymptotes

$y = (\frac{1}{3})^x$

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 $g(x)$.

reflection, stretch by 2, ↑4

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 $y = 2(3)^x$?

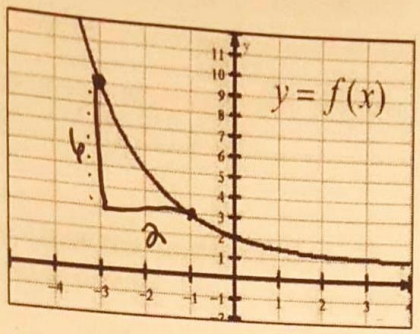
$2(3)^0 = 2(1) = 2$

a = y-intercept

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

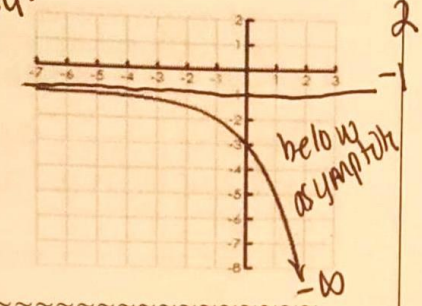
11. What is the average rate of change of $f(x)$ on the interval [-3, -1]?

a) -2
b) -3
c) -1/3
d) -1.5



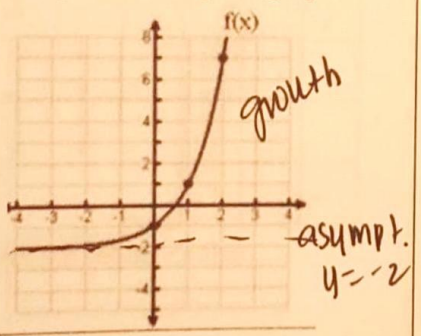

12. State the range for the function.

a) (-1, ∞) above asy.
b) (-∞, -1) below.
c) (-∞, 1) below
d) (-∞, ∞)

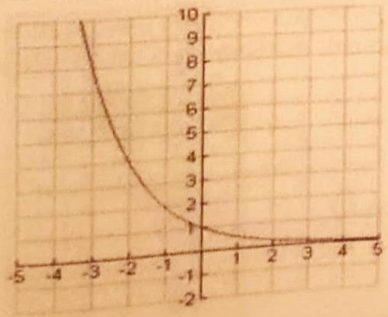



13. Determine the function represented by the graph.

a) $f(x) = (½)^x - 2$
b) $f(x) = (3)^x - 2$
c) $f(x) = (2)^x - 1$
d) $f(x) = (3)^x - 1$



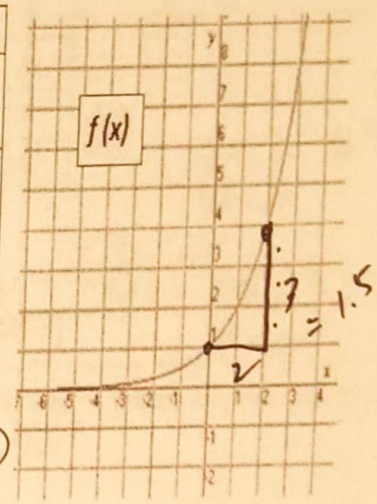

14. Which statement correctly describes part of the end behavior of the function graphed?



a) As $x \to \infty, y \to \infty$ Right False Right → 0
b) As $x \to -\infty, y \to 0$ left False, left → ∞
c) As $x \to \infty, y \to 0$ Right true
d) As $x \to -\infty, y \to -\infty$ left

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

| (x) | g (x) |
|---|---|
| -2 | -3 |
| -1 | -1 |
| 0 | 1 |
| 1 | 3 |
| 2 | 5 |




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

$200(1.02)^{100}$

17. Which function represents this sequence?

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

·3 ·3

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

$a_n = a_1(r)^{n-1}$
$a_n = 6(3)^{n-1}$

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

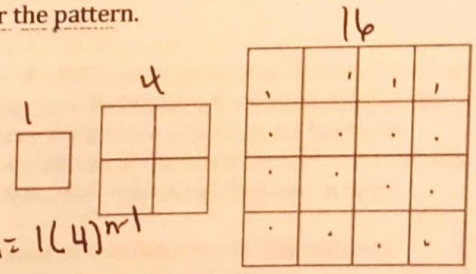
19. Which functions show the function $f(x) = 3^x$ being translated 5 units down?

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

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

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

21. Consider the pattern.



Which function represents the sequence that represents the pattern?

a) $a_n = 4^{n-1}$
b) $a_n = 4^{a_n - 1}$
c) $a_n = a_n * 4^{n-1}$
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 | C |
|---|---|
| 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) $f(x) = 8^x$
d) $f(x) = \frac{8}{5}(5)^x$

26. 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 |

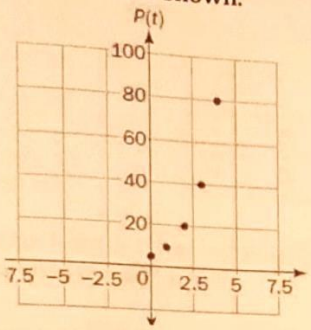
C.

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

D.

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 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

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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 $t \geq 0$. domain
b) Any whole number such that $t \geq 0$.
c) Any real number such that $0 \leq P(t) \leq 1000$. range
d) Any whole number such that $0 \leq P(t) \leq 1000$.

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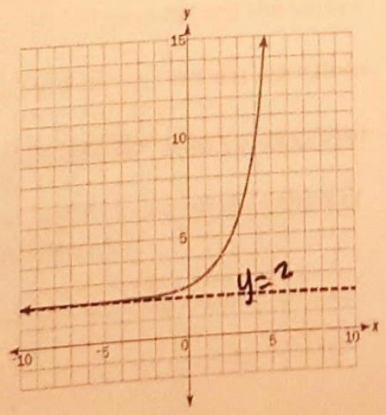
29. Look at the graph. Which equation represents this graph?

a) $y = 2^{x+1} - 2$
b) $y = 2^{x-1} + 2$
c) $y = 2^{x+2} - 1$
d) $y = 2^{x-2} + 1$

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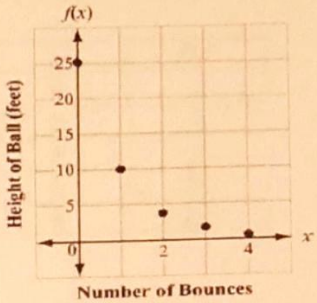
30. The function graphed on this coordinate gird shows f(x), the height of a dropped ball in feet after its xth bounce.




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

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

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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.

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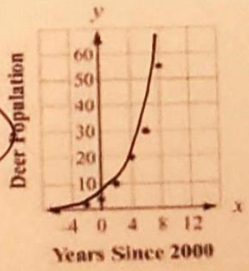
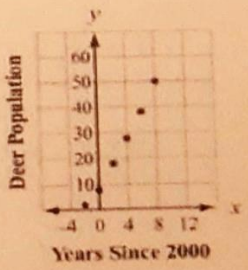
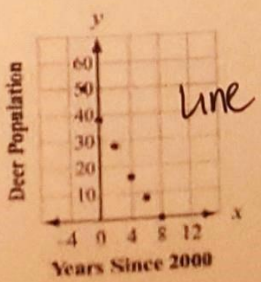
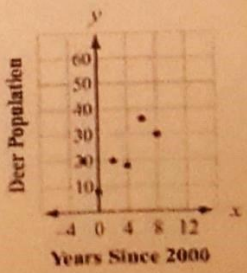
32. Which scatter plot BEST represents a model of exponential growth?

A.



B.



C.



line

D.

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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 |

| 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 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).

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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 |
| | 10 | 15 |

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].

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

a) Linear +
b) Quadratic vertex center
c) Exponential
d) Other

| x | f(x) |
|---|---|
| 0 | 1 |
| 2 | 4 |
| 4 | 16 |
| 6 | 64 |
| 8 | 256 |

.4