

H Algebra 1

Practice Test

Unit 4 Test – Exponential Functions

Read all directions carefully! You may use a calculator on this test. Record your answers on the answer sheet provided. Do NOT write on this test. Please record your answers on the answer sheet provided. Take your time, check your work, stay quiet, and good luck!

Learning Target 1: Transformations and Graphs of Exponential Functions

$x = \text{term \#}$
 $y = \text{sequence}$

1. Which set of data points represents an exponential function?

~~(A)~~ (-1, -3), (0, 0), (1, 3), (2, 6), (3, 12)

~~(C)~~ (-1, 3), (0, 0), (1, -3), (2, -6), (3, -12)

(B) (-1, 8), (0, 16), (1, 32), (2, 64), (3, 128) * 2

~~(D)~~ (-1, $\frac{1}{9}$), (0, 1), (1, 9), (2, 27), (3, 81)

2. Which equation represents the graph at the right?

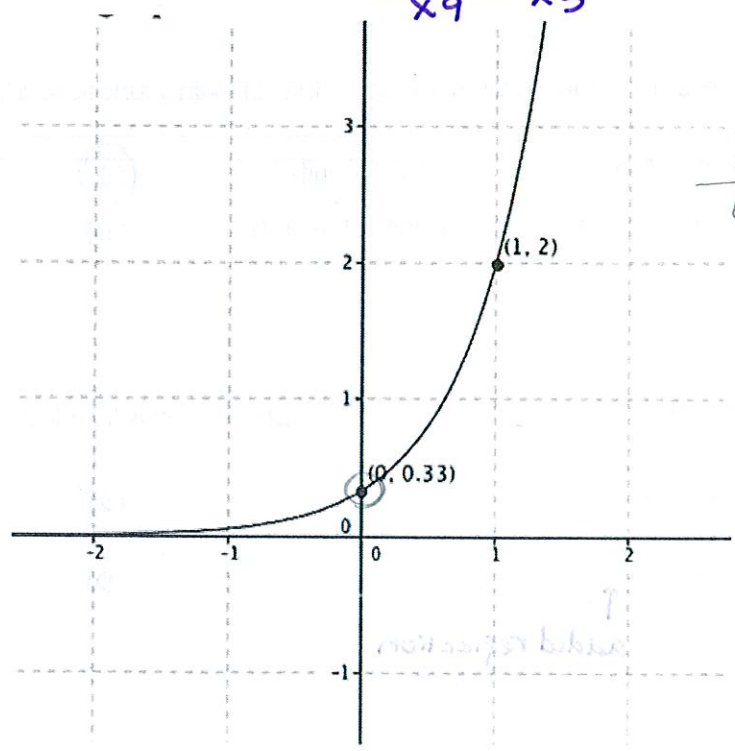
(A) $f(x) = 6^x$

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

(C) $f(x) = \frac{1}{3}(6)^x$

(D) $f(x) = 6\left(\frac{1}{3}\right)^x$

$y = a(b)^x$
↑ yint. ↑ rate



x	y
0	$\frac{1}{3}$
1	2

* 6

3. Which equation represents the graph at the right?

(A) $y = 8(3)^x$

(B) $y = 8\left(\frac{1}{3}\right)^x$

~~(C)~~ $y = 24(3)^x$

~~(D)~~ $y = 24\left(\frac{1}{3}\right)^x$

$y = a(b)^x$
↑ yint

x	0	1	2	3
y	8	24	72	216

yint * 3

4. Graph A is the graph of $y = 4(3)^x$ and graph B is the graph of $y = 3(4)^x$. Which statement about the two graphs is true?

- (A) Both graphs of A and B grow at the same rate.
(C) Graph A grows at a faster rate than graph B.

- (B) Graph B grows at a faster rate than graph A.
(D) The y-intercept of graph B is larger than the y-intercept of graph A.

5. What is the asymptote of the function $y = 3(2)^{x+1}$ Asymptote

- (A) $y = 0$
(C) $y = 3$

- (B) $y = -1$
(D) $y = 2$

6. Determine the transformations in the following function: $g(x) = 2^{x+3} - 6$ parent

- (A) Shift up 3 units and left 6 units
(C) Shift down 3 units and left 6 units

- (B) Shift down 6 units and left 3 units
(D) Shift down 6 units and right 3 units

7. Which function results when the graph of $y = 4^x$ is translated 3 units up and shrunk by $\frac{1}{4}$?

(A) $y = \frac{1}{4}(4)^x + 3$

~~(B) $y = \frac{1}{4}(4)^x - 3$~~

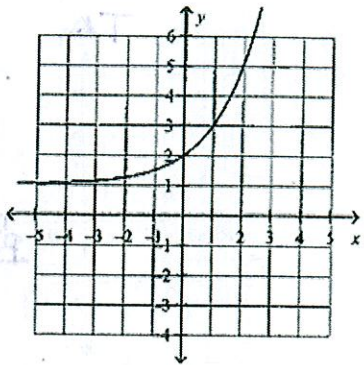
(C) $y = -\frac{1}{4}(4)^x + 3$

~~(D) $y = -\frac{1}{4}(4)^x - 3$~~

↑
added reflection

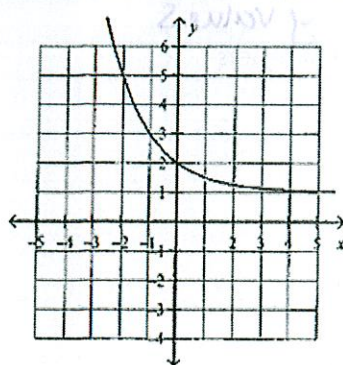
8. Which of the following graphs represents $y = 2^x + 1$? *Asymptote $y = 1$*

(A)

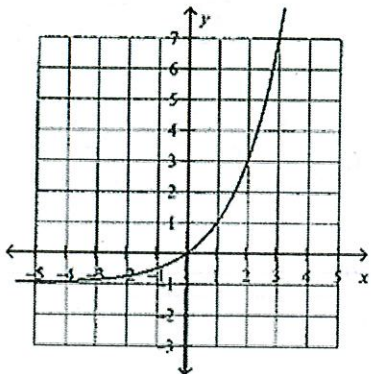


growth function

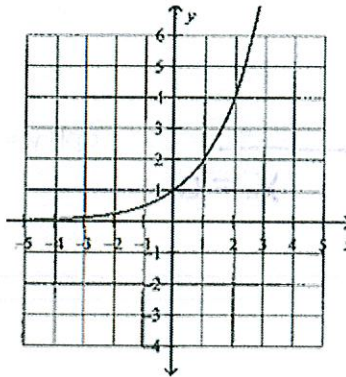
(B)



(C)



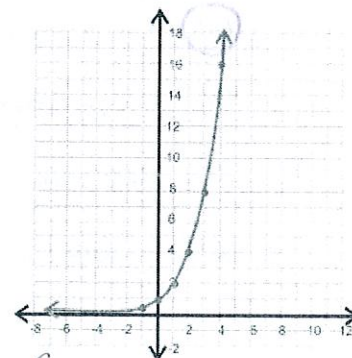
(D)



Learning Target 2: Characteristics of Exponential Functions

9. The graph below shows the function $f(x) = b^x$. Which statement must be true about b ?

- (A) $b > 1$
- (B) $0 < b < 1$
- (C) $b < 0$
- (D) $b < -1$



growth
(2, 8)
(3, 27)

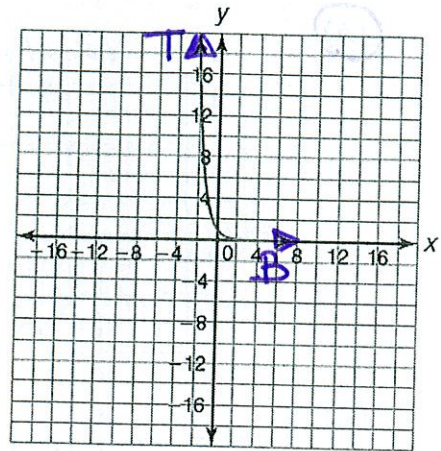
10. What is the domain of $f(x) = 7^x + 2$?

- (A) All Real Numbers Less than Zero
- (B) All Real Numbers Greater than One
- (C) All Positive Real Numbers
- (D) $(-\infty, \infty)$

11. What is the range of the function graphed below?

y values

- (A) All real numbers
- (B) $(0, \infty)$
- (C) $(-\infty, 0)$
- (D) $(-\infty, \infty)$



12. What is the y-intercept of the graph $y = 3\left(\frac{1}{5}\right)^x - 2$?

x=0

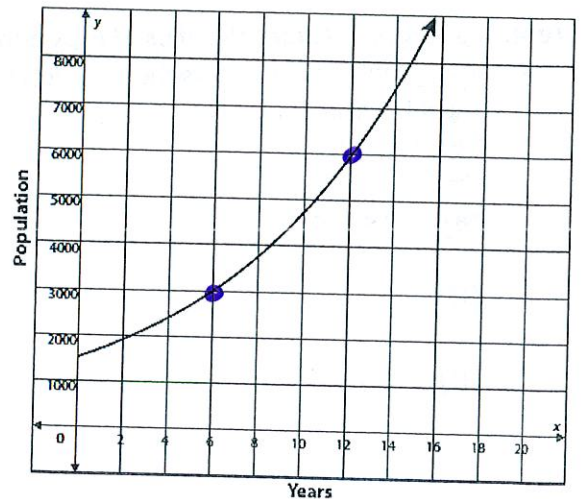
$$3\left(\frac{1}{5}\right)^0 - 2 = 3(1) - 2 = 3 - 2$$

- (A) $(0, -2)$
- (B) $(-2, 0)$
- (C) $(0, 1)$
- (D) $(0, 3)$

13. The graph below represents a population over time. What is the average rate of change for the function for the interval $[6, 12]$?

x values
 $6 \leq x \leq 12$

- (A) 500 people per year
- (B) -500 people per year
- (C) 3,000 people per year
- (D) The rate of change cannot be determined



$(6, 3000)$
 $(12, 6000)$

$$\frac{6000 - 3000}{12 - 6}$$

$$= \frac{3000}{6}$$

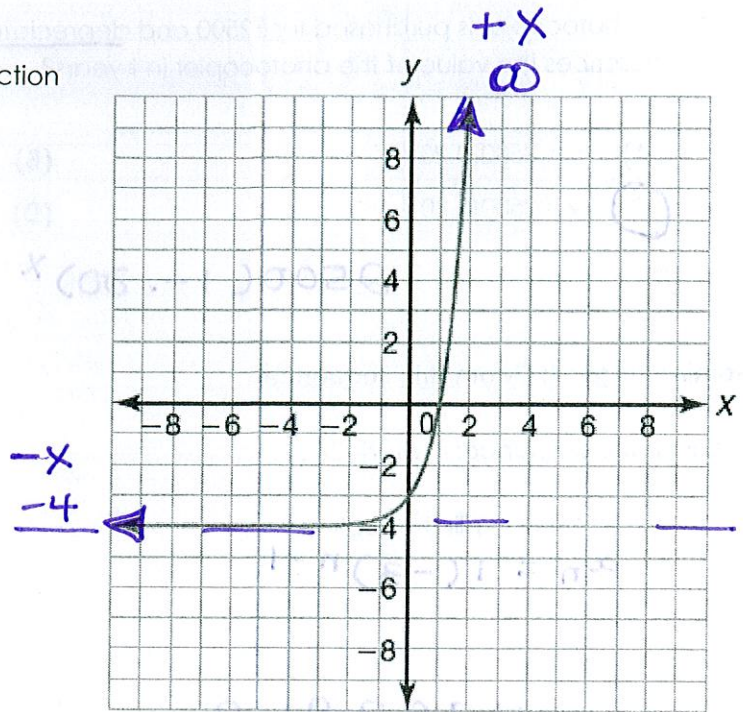
14. Which describes the end behavior of the function to the right?

(A) As $x \rightarrow -\infty$, $f(x) \rightarrow -4$
As $x \rightarrow \infty$, $f(x) \rightarrow -\infty$

(B) As $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$
As $x \rightarrow \infty$, $f(x) \rightarrow -\infty$

(C) As $x \rightarrow -\infty$, $f(x) \rightarrow -4$
As $x \rightarrow \infty$, $f(x) \rightarrow \infty$

(D) As $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$
As $x \rightarrow \infty$, $f(x) \rightarrow \infty$



Learning Target 3: Applications of Exponential Functions

15. What is the decay percent of the function $y = 2(0.78)^x$?

(A) 78%

(B) 22%

(C) 7.8%

(D) 2.2%

16. A coffee is sitting on Mr. Hunt's desk cooling. It cools according to the function $T = 70(0.80)^x$, where x is the time in minutes and T is the temperature in degrees Celsius. What is the initial temperature of the coffee?

(A) 20

(B) 70

(C) 80

(D) 90

17. The function $f(x) = 5,000(1.07)^x$, where x is the time in years, models a growing tiger population. How many tigers will there be in 6 years?

(A) 32,100 tigers

(B) 120,688 tigers

(C) 3,235 tigers

(D) 7,504 tigers

7,503.65

18. A photocopier is purchased for \$2500 and depreciates in value by 20% per year. Which equation best describes the value of the photocopier in t years?

(A) $y = 2500(0.20)^x$

(B) $y = 2500(1.20)^x$

(C) $y = 2500(0.80)^x$

(D) $y = 2500(20)^x$

$2500(1 - .20)^x$

Learning Target 4: Geometric Sequences

19. Given the sequence: 1, -3, 9, -27 ...

a. Write an explicit equation.

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

b. Find a_{15}

4,782,969

20. Given the recursive formula: $a_n = a_{n-1} \cdot 4$ with $a_1 = -1$

a. Write an explicit formula

$a_n = -1(-4)^{n-1}$

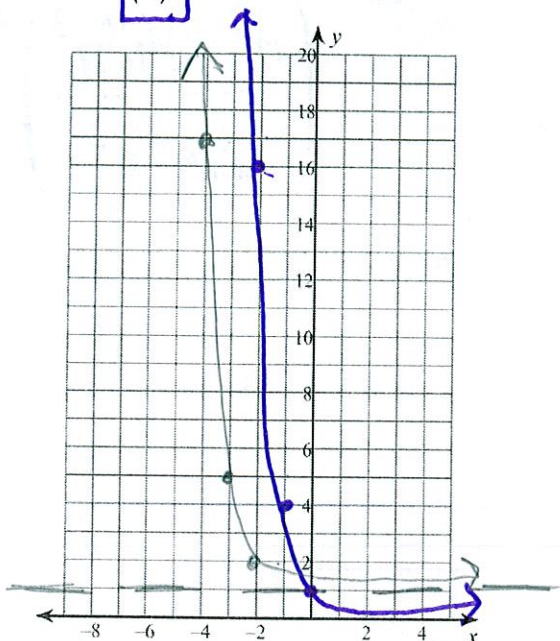
b. Find a_{12}

4,194,304

Learning Target 5: Graphing Exponential Functions and Identifying Key Characteristics

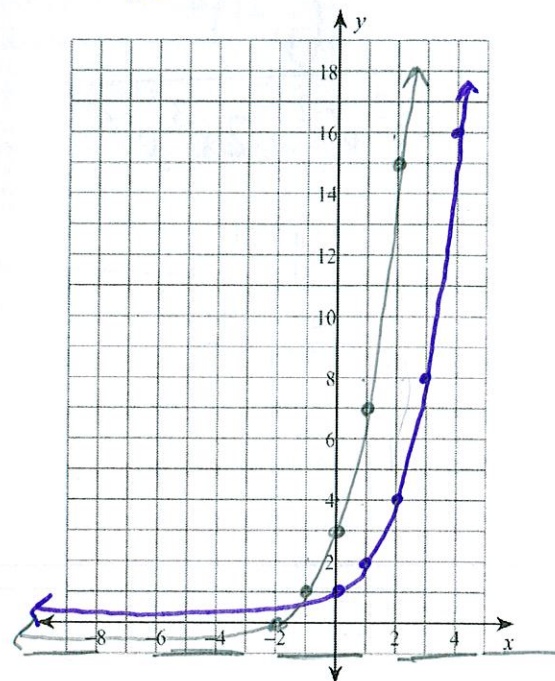
21.

parent
 $f(x) = \left(\frac{1}{4}\right)^{x+2} + 1$



22.

parent
 $f(x) = 2^{x+2} - 1$



Domain: $(-\infty, \infty)$

Range: $(1, \infty)$

x intercept: NONE

y intercept: $(0, 1.0625)$ $\frac{1}{4}^{0+2} + 1$

Increasing Interval: NONE $\frac{1}{4}^2 + 1$

Decreasing Interval: $(-\infty, \infty)$

Asymptote: $y = 1$

Rate of Change $-3 \leq x \leq 0$

$$\frac{(-3, 5) \quad 1.0625 - 5}{(0, 1.0625) \quad 0 - -3}$$

$$= \frac{-3.9375}{3}$$

$$= -1.3125$$

$$= \boxed{-1.3125}$$

Domain: $(-\infty, \infty)$

Range: $(-1, \infty)$

x intercept: $(-2, 0)$

y intercept: $(0, 3)$

Increasing Interval: $(-\infty, \infty)$

Decreasing Interval: NONE

Asymptote: $y = -1$

Rate of Change $1 \leq x \leq 2$

$$\frac{(1, 7) \quad 15 - 7}{(2, 15) \quad 2 - 1} = \boxed{\frac{8}{1}}$$

Learning Target 6: Properties of Exponents

23.

$$\frac{(y^{-1})^4}{x^2 y^{-2} \cdot 2x^3 y^{-4}}$$

$$= \frac{y^{-4}}{2x^5 y^{-6}}$$

$$= \frac{y^6}{2x^5 y^4}$$

$$= \boxed{\frac{y^2}{2x^5}}$$

24.

$$\left(\frac{n^2 \cdot m^0 n^3}{2m^2 n^2} \right)^3$$

$$= \frac{n^6 \cdot m^0 n^9}{2^3 m^6 n^2}$$

$$= \frac{n^{15} m^0}{8m^6 n^2}$$

$$= \boxed{\frac{n^{13}}{8m^6}}$$

25.

$$\frac{(y^{-3} \cdot 2xy^2)^{-3}}{x^{-2} y^{-3}}$$

$$= \frac{y^9 \cdot 2^{-3} x^{-3} y^{-6}}{x^{-2} y^{-3}}$$

$$= \frac{\cancel{2^{-3}} x^{-3} y^3}{x^{-2} y^{-3}}$$

$$= \frac{y^3 x^2 y^3}{2^3 x^3}$$

$$= \boxed{\frac{y^6}{8x}}$$

26.

$$\frac{2u^{-2} v^0}{u^4 v^4 \cdot (2u^0)^{-1}}$$

$$= \frac{2u^{-2} v^0}{u^4 v^4 \cdot 2^{-1} u^0}$$

$$= \frac{\cancel{2}^{-2} v^0}{2^1 u^4 v^4}$$

$$= \frac{2v^0 \cdot 2}{u^2 u^4 v^4}$$

$$= \boxed{\frac{4}{u^6 v^4}}$$