TEST NAME: **Exponential Study Guide**
TEST ID: **3022302**
GRADE: **09 - Ninth Grade**
SUBJECT: **Mathematics**
TEST CATEGORY: **Shared Classroom Assessments**

1. Two functions are shown in the table below.

x	f(x)	g(x)
⁻3	1	8
⁻2	4	4
⁻1	7	2
0	10	1

Which statement is true about the two functions when $x = {}^-6$?

A. The value of $f(x)$ exceeds the value of $g(x)$ by 56.

B. The value of $g(x)$ exceeds the value of $f(x)$ by 56.

C. The value of $f(x)$ exceeds the value of $g(x)$ by 72.

D. The value of $g(x)$ exceeds the value of $f(x)$ by 72.

2. Two functions are shown below.

$$f(x) = 1.02x + 100$$
$$g(x) = 50(1.02)^x$$

What is the smallest positive integer in which the value of $g(x)$ exceeds the value of $f(x)$?

A. 60

B. 59

C. 55

D. 50

3. The function $f(x) = 1.69(1.03)^x$ models the value of an investment, in thousands, after x years. What is the yearly interest rate the investment is earning?

   A. 3%

   B. 31%

   C. 69%

   D. 97%

4. In which function is the population, y, increasing by 50 each month, x?

   A. $y = 50x + 100$

   B. $y = 100(50)^x$

   C. $y = 100x + 50$

   D. $y = 50(100)^x$

5. For what positive integer value of x will the value of $g(x) = 3^x$ first exceed the value of $f(x) = 2x + 25$?

   A. 3

   B. 4

   C. 25

   D. 26

6. The number of female nurses in a country can be predicted using the function $f(t)=7,300 + 25t$, where t is the number of years since 2000. The number of male nurses can be predicted using the function $m(t) = 2,500(1.02)^t$, where t is the number of years since 2000. **About** how many years will it take before the number of male nurses is expected to exceed the number of female nurses?

   A. 60

   B. 65

   C. 70

   D. 75

7. The function $f(x) = 2,500(0.97)^x$ models the value of an investment after x months. Which statement is true about the value of the investment?

   A. The value of the investment increases by 3% each month.

   B. The value of the investment decreases by 3% each month.

   C. The value of the investment increases by 97% each month.

   D. The value of the investment decreases by 97% each month.

8. A scientist is observing the size of a sample of bacteria. The function $f(t) = 1,000(0.995)^t$ models the size of the sample t hours after the scientist began his observations. Which statement is true about the size of the sample?

   A. The sample is growing at a rate of 99.5% per hour.

   B. The sample is decaying at a rate of 99.5% per hour.

   C. The sample is growing at a rate of 0.5% per hour.

   D. The sample is decaying at a rate of 0.5% per hour.

9. Which function could represent a population that is growing at a rate of 15% per year, t?

   A. $P = 1,500(0.85)^t$

   B. $P = 0.85(1,500)^t$

   C. $P = 1,500(1.15)^t$

   D. $P = 1.15(1,500)^t$

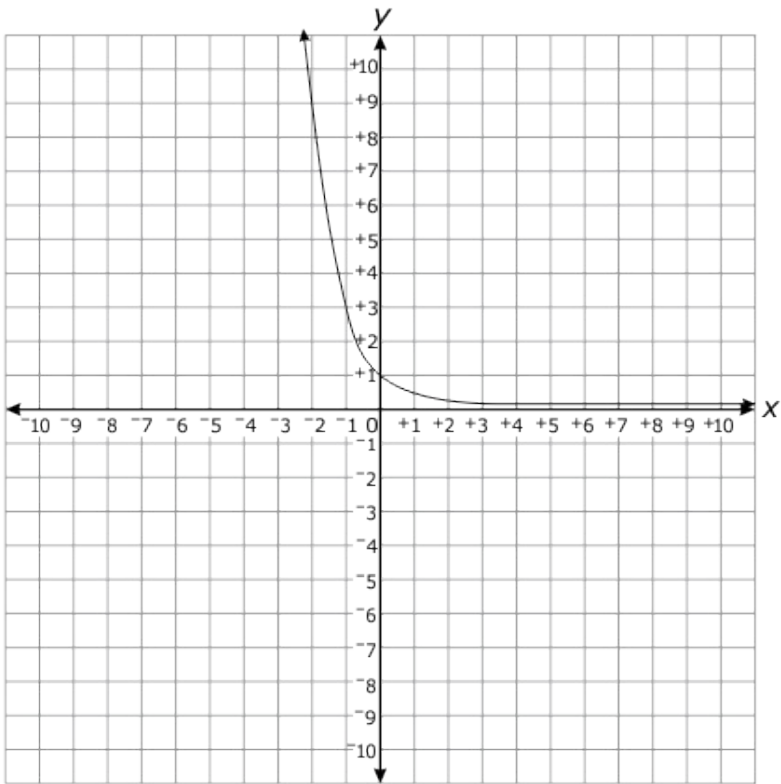10. Which is the graph of $y = 3^x$?
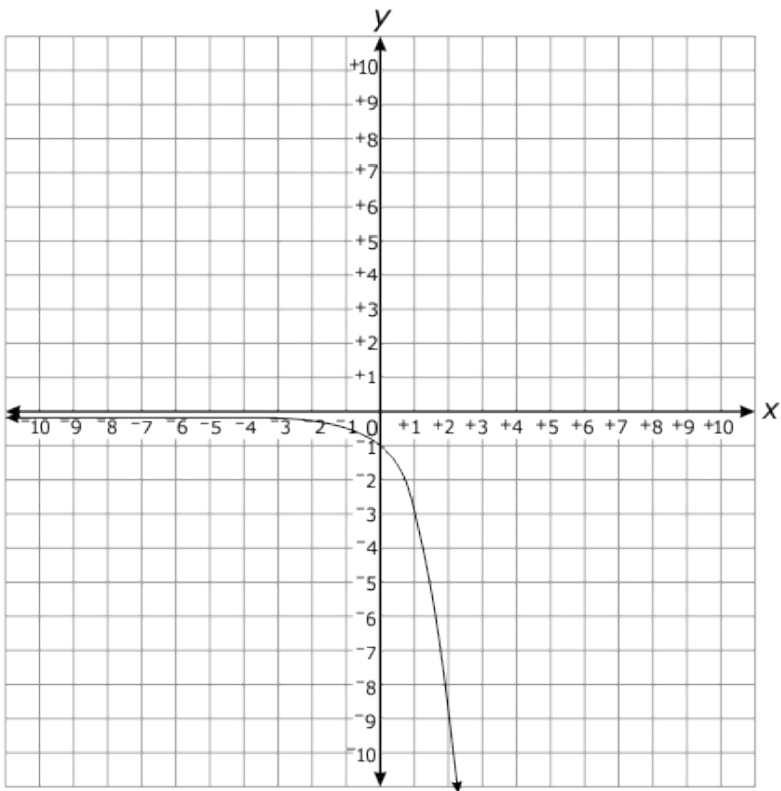
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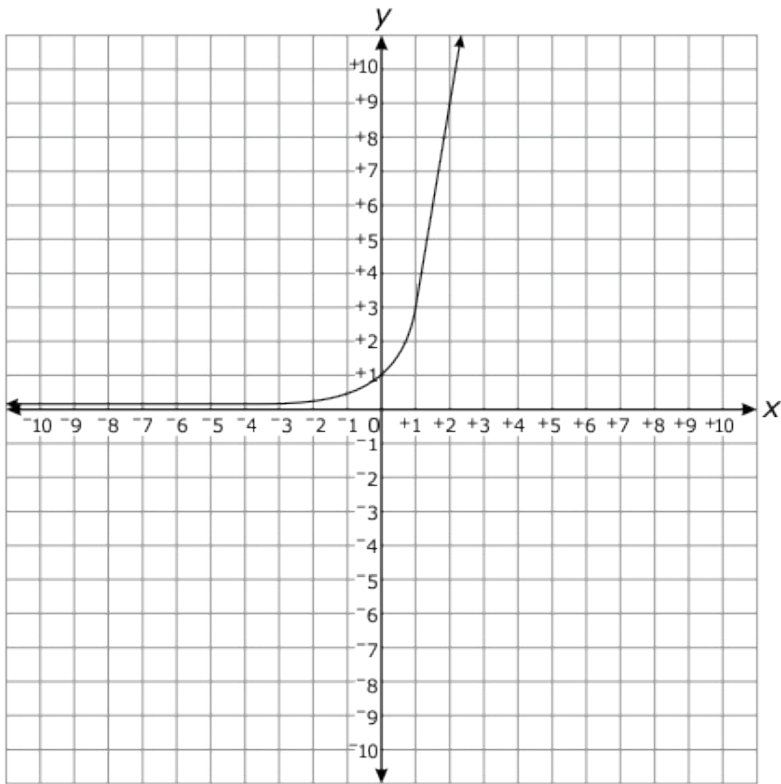
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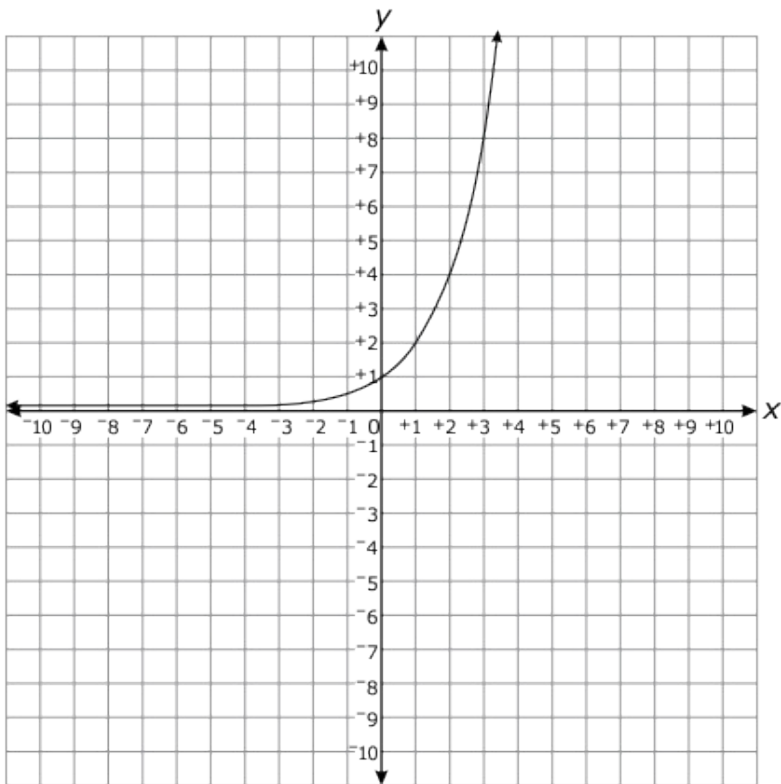
C.

D.

11. The function $v(x) = 20,000(0.87)^x$ models the value of a car x years after its purchase. Which **best** describes the rate of change in the value of the car?

A. exponential growth of 87% each year

B. exponential growth of 13% each year

C. exponential decay of 87% each year

D. exponential decay of 13% each year

12. Clara's and Michelle's parents started saving for college in 1998.

- Clara's college fund can be modeled by the function $f(x) = 500x + 2,500$, where x is the number of years since 1998.
- Michelle's college fund can be modeled by the function $g(x) = 2,500(1.1)^x$, where x is the number of years since 1998.

About what year will Michelle's college fund first exceed Clara's college fund?

A. 2013

B. 2015

C. 2017

D. 2019

13. What is the y-intercept for the graph of the function $f(x) = 30(1.05)^x$?

A. 0

B. 1

C. 5

D. 30

14. The equation $y = 250(1.05)^x$ models the value of an investment after x years. Which statement is true about the value of the investment?

A. The value of the investment is growing by $250 each year.

B. The value of the investment is growing by 5% each year.

C. The value of the investment is decreasing by $250 each year.

D. The value of the investment is decreasing by 5% each year.

15. A tennis tournament starts with 120 players. During each round of play, half of the players are eliminated from the tournament. What type of function **best** models the relationship between the number of players in the tournament, *y*, and the round of play, *x*?

   A. A linear function, because the number of players is changing at a constant rate per unit interval.

   B. A linear function, because the number of players is changing at a constant percent rate per unit interval.

   C. An exponential function, because the number of players is changing at a constant rate per unit interval.

   D. An exponential function, because the number of players is changing at a constant percent rate per unit interval.

16. Mariah has a job that earns a pay raise of 2.5% per year for every year that she works. Which type of function would model Mariah's pay after *t* years?

   A. linear function with a positive slope

   B. linear function with a negative slope

   C. exponential growth function

   D. exponential decay function

17. Juan invested $1,000. The value of the investment at the end of different years is shown in the table below.

Year (x)	Value (y)
0	$1,000.00
1	$1,120.00
2	$1,254.40
3	$1,404.93
4	$1,573.52

Which function **best** represents the data?

A. $y = 1,000(1.12)^x$

B. $y = 1,000(0.12)^x$

C. $y = 1,000 + 1.12x$

D. $y = 1,000 + 0.12x$

18. The function $f(x) = 20(4)^x$ represents the total number of bacteria in a petri dish, $f(x)$, after x hours. Which statement is true about the bacteria?

A. Initially, there were 4 bacteria in the petri dish.

B. Initially, there were 80 bacteria in the petri dish.

C. The number of bacteria in the petri dish increases by 20 every hour.

D. The number of bacteria in the petri dish quadruples every hour.

19. Which situation is **best** modeled by an exponential function?

A. A restaurant charges $5.75 per meal, plus 7.5% tax.

B. A cab company charges a flat fee of $2.50, plus $0.45 per mile traveled.

C. The number of cell phone subscribers increased by 75% per year for the last 20 years.

D. Water pressure is 14.7 pounds per square inch at sea level and increases an additional 14.7 pounds per square inch for every 10 meters of depth.

20. Which equation, when graphed, is an exponential growth function with a *y*-intercept at 2?

   A. $y = 2x$

   B. $y = 2(2)^x$

   C. $y = 2(0.5)^x$

   D. $y = x^2 + 2$