Review: Exponential & Logarithmic Functions

Name: ______________________ **Date:** __________

1. Which situation could be best modeled with an exponential function?

   A. the value of a car that loses 6% of its value per year

   B. the cost to purchase different weights of bananas at a store

   C. the total number of miles run by a person who runs 8 miles per day

2. Automobiles start losing value, or depreciating, as soon as they leave the car dealership. Five years ago, a family purchased a new car that cost \$16,490.

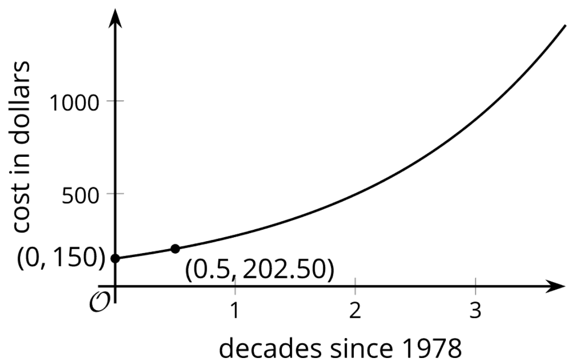
   If the car lost 13% of its value each year, what is the value of the car now?

3. Suppose the growth of a quantity y follows the exponential model $y = a \cdot b^t$. Determine its value at $t = 30$; given that its initial value is 100 and its value at $t = 10$ is 250.

   A. 750 B. 1250

   C. 1387.5 D. 1562.5

4. The graph represents the cost of a medical treatment, in dollars, as a function of time, d, in decades since 1978.



   Find the cost of the treatment, in dollars, when $d = 1$. Show your reasoning.

5. The equation $c = 523,430(1.193)^t$ models the pounds of U.S. copper produced in the period from 1987 to 1992. Which statement *best* interprets the coefficient and base of this equation?

   A. The copper production in 1987 was 523,430 pounds, and it increased at a rate of 1.93% per year during that period.

   B. The copper production in 1987 was 523,430 pounds, and it increased at a rate of 19.3% per year during that period.

   C. The copper production increased by a factor of 523,430 × 1.193 pounds per year during that period.

   D. The copper production at the beginning of 1987 was at 1.193 pounds, and it increased by a factor of 523,430 pounds per year during that period.

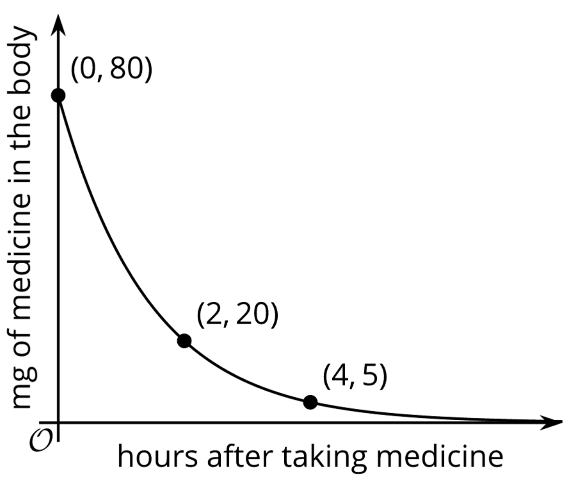
6. The population of a town is growing exponentially and can be modeled by the equation $f(t) = 42 \cdot e^{(0.015t)}$. The population is measured in thousands, and time is measured in years since 1950.

   a) What was the population of the town in 1950?

   b) What is the approximate percent increase in the population each year?

   c) According to this model, approximately what was the population in 1960?

7. The function f represents the amount of a medicine, in mg, in a person's body t hours after taking the medicine. Here is a graph of f.



   a) How many mg of the medicine did the person take?

   b) Write an equation that defines f.

   c) After 7 hours, how many mg of medicine remain in the person's body?

8. In 1990, the value of a home is \$170,000. Since then, its value has increased 5% per year.

   a) What is the approximate value of the home in the year 1993?

   b) Write an equation, in function notation, to represent the value of the home as a function of time in years since 1990, t.

   c) Will the value of the home be more than \$500,000 in 2020 (assuming that the trend continues)? Show your reasoning.

9. What is the value of x in the equation $81^{x+2} = 27^{5x+4}$?

   A. $-\frac{2}{11}$ B. $-\frac{3}{2}$ C. $\frac{4}{11}$ D. $-\frac{4}{11}$

10. Which value of k satisfies the equation $8^{3k+4} = 4^{2k-1}$?

   A. -1 B. $-\frac{9}{4}$ C. -2 D. $-\frac{14}{5}$

11. Which expression is the simplified version of $\log x + \log y - k \log r$?

   A. $\log\left(\frac{xy}{r^k}\right)$ B. $\frac{\log(x+y)}{r^k}$

   C. $\log(x + y - r^k)$ D. $\log(x+y) - k\log r$

12. Solve for x: $6^{3x} = 30$

A. $x = 3\ln 5$

B. $x = \ln 30 - 3\ln 6$

C. $x = \dfrac{\ln 10}{\ln 6}$

D. $x = \dfrac{\ln 30}{3\ln 6}$

13. What is the value of $\log_3 27$?

A. 2 B. 3 C. 6 D. 9

14. Which equation is equivalent to $\log_3 \frac{1}{9} = x$?

A. $\frac{1^3}{9} = x^3$

B. $\left(\frac{1}{9}\right)^3 = x$

C. $3^x = \frac{1}{9}$

D. $3^{\frac{1}{9}} = x$

15. Solve the equation $50 \cdot (1.06)^x = 65$.

16. Solve for x: $\log_{10}(7-x) - \log_{10}(3x+2) = 1$.

A. $-\frac{13}{31}$ B. $-\frac{27}{29}$ C. $\frac{9}{4}$

D. none of these

17. The population of algae in a small tank is modeled by $P(t) = 0.02e^{0.017t}$, where $P(t)$ represents the present volume of algae and t the number of months. When will the population double?

18. A biologist is culturing a new strain of bacteria, starting with just a few cells. When she first observes the bacteria colony, the population is 1,000 cells and is doubling every 20 minutes. This rate of growth continues for the rest of the day.

a) Write a function that represents the population of the bacteria colony as a function of time in minutes.

b) How long will it take the population to reach 8,000?

c) How long will it take the population to reach 20,000?

19. What value of x satisfies the equation $\log_3(x-4) = 2$?

A. 5 B. 10 C. 12 D. 13

20. Solve for $200e^{0.04t} = 450$ for t.

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1.
Answer: A
Points: 1

2.
Answer:
Points: 1

3.
Answer: D
Points: 1

4.
Answer:
Points: 1

5.
Answer: B
Objective: 2.03
Points: 1

6.
Answer:
Points: 1

7.
Answer:
Points: 1

8.
Answer:
Points: 1

9.
Answer: D
Points: 1

10.
Answer: D
Points: 1

11.
Answer: A
Points: 1

12.
Answer: D
Objective: 1.01
Points: 1

13.
Answer: B
Objective: 2A.14.0
Points: 1

14.
Answer: C
Objective: 2A.11.1
Points: 1

15.
Answer: $x = 4.50$
Points: 1

16.
Answer: A
Points: 1

17.
Answer: ≈ 40.8 years
Points: 1

18.
Answer: $P(t) = 1000(2)^{\frac{t}{20}}$; 60 minutes; 86.4 minutes
Objective: CC F.LE.4
Points: 1

19.
Answer: D
Objective: 2.01.a
Points: 1

20.
Answer: $t \approx 20.3$
Objective: CC F.LE.4
Points: 1