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Unit 6: Exponential Functions Study Guide

Calculator Active

1. What is the 8th term in the geometric sequence? $4, -12, 36, -108, \ldots$

$a_n = 4(-3)^{n-1}$ $a_8 = 4(-3)^{8-1}$ $a_8 = -8748$

2. Write an equation that correctly models the relationship between hours passed, h, and the number of bacteria present, b, as shown in the table.

Hours Passed	0	1	2	3	4
Number of Bacteria	1	4	16	64	256

$b = 4^h$

3. Many times a tweet will be tweeted and then retweeted with the possible number of retweets growing exponentially. Javar modeled this phenomenon with the function $f(x) = 4(2)^x$, using x to represent the number of intervals in which the tweet was retweeted.

   a. What were the original number of tweets? $a = 4$
   b. What is the common ratio in the function? $b = 2$

4. After a dose of an antibiotic, the number of bacteria decreases. If the equation $y = 16{,}000(0.75)^x$ models this "decay" situation, which value in the equation represents the original number of bacteria?

$a = 16{,}000$

5. The number of kilograms, y, of a radioactive element that remains after t hours can be modeled by the equation $y = .47(0.83)^t$. What is the rate of decrease of this radioactive element?

$1 - r = .83$ $r = 17\%$

6. Sarah invests $2,517 in an account that is compounded annually and pays an interest of 2.4% each year. By what factor is the investment increasing every year?

$r = .024$

a. 60.41 b. 1.024 c. .976 d. 2577.41

7. The equation $y = 325(1.06)^x$ 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 6% each year.
   b. The value of the investment is decreasing by 6% each year.
   c. The value of the investment is growing my $325 each year.
   d. The value of the investment is decreasing by $325 each year.

$-\frac{1}{2}$

8. A stock loses half its value every week. If the stock was worth $300 starting out, what is it worth after 4 weeks at this rate of decline?

$300(1-0.5)^t$ $300(.5)^4$ $\$18.75$

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9. A copy machine depreciates at the rate of 12% each year. If the original cost of the copy machine was $18,500, what is the approximate value of the machine at the end of 4 years?

$a=18500$
$r=.12$
$t=5$

$y=18500(1-.12)^t$
$y=18500(.88)^5$
$\$9703.04$

10. At the beginning of an experiment, there are 200 bacteria in a certain culture. If the number of bacteria doubles every hour, how many bacteria will be in the culture at the end of 5 hours?

$a=200$
$r=1$
$t=5$

$y=200(1+1)^t$
$y=200(2)^5$
0400 bacteria

11. Susie did an experiment to compare two methods of warming an object. The results are shown in the table below.

Time (Hours)	Method 1 Temperature	Method 2 Temperature
0	0	1.5
1	5	3
2	10	6
3	14	12
4	18	24
5	23	48

Did either method change at a constant rate? Did either method change exponentially? Explain.

↓ No

↓ yes, method 2 increased by multiplying by 2.

12. The Hatch family wants to start saving for a college fund. They deposited $1000 into a bank account that will earn 12% interest per year. How much will the Hatch family have saved for the college fund after 13 years?

$a=1000$
$r=12\%$
$t=13$

$y=1000(1+.12)^t$
$y=1000(1.12)^{13}$
$\$4363.49$

13. Determine if the given function is growth or decay and identify the rate (%)

$f(x) = 5{,}000(.10)^x$

$1-r=.10$

Circle one: Growth or (Decay) *Rate as a percent:* 90%

14. In 2003, Bianca put $2,700 into a savings account that earns a yearly interest rate of 3.8%. If she took the money out of the account in 2014, how much money did she have at that time? Round to the nearest hundredth.

$a=2700$
$r=3.8\% \rightarrow .038$
$t=11$

$y=2700(1.038)^{11}$
$y=\$4,009.44$

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15. Each year the local country club sponsors a tennis tournament. Play starts with 164 participants. During each round, half of the players are eliminated. Write an exponential function to describe this situation. $y = 104(1-0.5)^x$

$y = 104(.5)^x$

16. Identify all of the statements that are true for this function: $f(x) = 1500(1.73)^x$
    - ○ This function models exponential decay.
    - ☒ This function models exponential growth.
    - ☒ The growth/decay factor is 73%.
    - ☒ The growth/decay factor is 1.73.

17. Determine if the given function is growth or decay and identify the rate (%)

$$f(x) = 1500(1.73)^x$$

Circle one: (Growth) or Decay *Rate as a percent:* 73%

18. Given, $f(x) = 0.25(1.25)^x$ identify the growth/decay factor, growth/decay rate, and the initial value.

Growth/Decay Factor: 1.25 Growth/Decay Rate: 25%

Initial Value: 0.25

19. A club began with 5 members. Each month, each member brought one new member. Write a function that can be used to determine the number of members x months after the club began.

$y = 5(2)^x$

20. Every ten years, the Census counts how many people are living in every town in the United States.

- The 2010 Census showed that 1,000 people were living in Appleville, and 4,000 people were living in Bridgetown.
- The population of Appleville is predicted to double every ten years. → $y = 1000(2)^x$
- The population of Bridgetown is predicted to increase by 1,000 every ten years. → $y = 1000x + 4000$

If the predictions come true, what will be the first census year that will show Appleville with a larger than Bridgetown?

y_2 $x = 3$ → 30 years → 2010 + 30 = 2040 y_1 2040

21. The function $f(x) = 2(.62)^x$ was replaced with $f(x) + k$, so that the y-intercept was moved to $(0, -5)$. What is the value of k?

$(0, 2) \rightarrow (0, -5)$

$2 + k = -5$

$-2 \quad -2$

$k = -7$