

Name _____ Date: _____ Class: _____

Multiple Choice. Choose the best answer.

$$A = 250e^{(-0.0233 \times 4)} \approx 227.8 \text{ mg}$$

_____ 1. Suppose the amount of radioactive substance remaining in a 250 milligram sample after t years can be modeled by $A = 250e^{-0.0233t}$. How much is remaining after 4 years?

_____ 2. Which of the following equations represents exponential growth?

- A. $y = 100(1.7)^2$ B. $y = 100(.65)^{5 \cdot 2}$ C. $y = 100(0.72)^{5 \cdot 2}$ D. $y = 100(1 - .4)^{5 \cdot 2}$

↑ only this one because the base is greater than 1

OMIT _____ 3. A population of 670 animals decreases at an annual rate of 16%. Identify the exponential function that models this situation.

$$y = 670(1 - .16)^t$$

- A. $y = 670(1.52)^x$ B. $y = 670^{0.11x}$ C. $y = 670(1 - 0.11)^x$ D. $y = (-1 - 0.89)670^x$

D _____ 4. Which of the following functions has a loss of value depreciation rate of 6%?

- A. $y = 50(.91)^t$ B. $y = 50(1.4)^t$ C. $y = 50(1 - .09)^t$ D. $y = 50(1 - .06)^t$

_____ 5. The equation $P = 52(1.18)^t$ represents the growth of bacteria in a petri dish after t hours.

Which of the following statements is **not true**?

- A. The bacteria are growing at a rate of 18% each hour. TRUE
 B. The population will be less than 300 after 10 hours. 272 TRUE
 C. The population will be less than 2500 after one day. 2761 FALSE
 D. There are 52 bacteria at the beginning of the experiment. TRUE

_____ 6. Mr. Eber is getting a new calculator! The projected selling price of the calculator at any time can be modeled by the equation $y = 110(0.88)^x$. The variable x represents the number of years since 2008. Find the projected worth of the calculator in 2015.

$$y = 110(.88)^7 \approx \$45.00$$

_____ 7. A certain population of animal increases at an annual rate of 9% a year. If the initial population was 126 which equation represents the current population, P , of the animals after 3 years?

$$y = 126(1 + .09)^3 \approx 163$$

8. How much more money will you save after 15 years if you invest \$850 at 5.85% compounded weekly than you will if you invest your money at the same rate and time period compounded monthly?

$$y = 850 \left(1 + \frac{.0585}{52}\right)^{52 \times 15}$$

$$\$ 2043.14$$

$$y = 850 \left(1 + \frac{.0585}{12}\right)^{15 \cdot 12}$$

$$\$ 2039.17$$

2043.14
 2039.17
 3.35

Read each of the following applications problems carefully. Determine whether the situation models **growth or decay, compounded or continuously compounded interest**. Write an equation to model the problem, then solve.

Simple Interest: $y = a(1+r)^t$ $y = a(1-r)^t$

Compounding: $y = a(1 + \frac{r}{n})^{nt}$ $y = a(1 - \frac{r}{n})^{nt}$ **Continuously Compounding:** $y = pe^{rt}$

8. So you want to breed rabbits? If you start with eight pairs of bunnies and the rabbit population increases at an average rate of 13% each month, how many rabbits will you expect to have at the end of the year?

$$y = 16(1 + .13)^t$$

$$y = 16(1.13)^{12}$$

≈ 69

9. The local credit union is advertising 6.2% interest compounded continuously. If you invest your \$15,000 inheritance, how much money would you have at the end of 10 years?

$$y = 15,000e^{.062 \times 10}$$

\$27,883.92

10. You have \$43,000 in an account. If the account pays 15% interest rate, over 7 years, what was your initial deposit?

$$43,000 = a(1 + .15)^7$$

$$\frac{43,000}{(1.15)^7} = a$$

\$16,165.29

11. Your car was purchased in 2012 for \$13,000 and depreciates at a rate of 11% per year. How much will your car be worth in the year 2020?

$$y = 13,000(1 - .11)^8$$

\$5117.57

12. A family of nine vampires has just moved into Legacy Park. If the vampire population grows at a rate of 15% **each day**

a. How many vampires will there be in **one week?** $t=7$ 24

b. How many vampires will there be in **one year?** $t=365$ 1.29×10^{23}

$$y = 9(1 + .15)^7$$

$$y = 9(1 + .15)^{365}$$

the # is extremely large; write using scientific notation

13. If the annual rate of inflation averages 3%, then the approximate cost C of goods or services during any year in that decade will be given by $C = P(1.03)^t$, where t is the time in years and P is the present cost. If the price of an oil change for your car is presently \$19.95, estimate the price 10 years from now.

$$C = 19.95(1.03)^{10}$$

↑ same as "present cost"

\$26.81

14. The equation $C = 1600(1.23)^t$ models the tuition at a private college since the year 2004.

A. Is the tuition increasing or decreasing? How do you know? It is increasing; the base is greater than 1 indicating an increase of .23 (23%)

B. What was the tuition? \$1600 in 2004

C. Estimate the tuition for the year 2010. \$5540.52
 ↑ $t=6$

15. The equation $V = 15,950(.728)^t$ models the value of a car t years after its initial purchase.

A. Is the value of the car increasing or decreasing? How do you know? It is decreasing; the base is less than 1 (to find the decay rate, subtract: $1 - .728 = 0.272$ or 27.2%)

B. Approximate the value of the car after 5 years. \$3261.50

16. Janice deposited money in the bank 4 years ago at a rate of 23% per year. She currently has \$16,000 in the account. What was her initial deposit? ← a

$$16,000 = a(1 + .23)^4$$

\$6990.36

$$\frac{16,000}{(1 + .23)^4} = a$$

17. In 2010 you put \$3600 in an account that is compounded continuously at a rate of 4.5%. How much is it worth today?

$$y = 3600e^{(.045)(7)}$$

\$4932.93

18. You have \$4500 to deposit into a savings account. Determine which of these investments will yield the higher balance. Round each value to two decimal places. Show your work.

CIRCLE THE BEST OPTION

<p><u>Option 1</u> Deposit your money with Bank A which offers 2.25% compounded <u>semi-annually</u> for 11 years. $r = .0225$ $n = 2$</p> $y = 4500 \left(1 + \frac{.0225}{2} \right)^{2 \cdot 11}$ <p style="text-align: center;">\$ 5755.73</p>	<p><u>Option 2</u> Deposit your money with Bank B which offers 5% interest compounded <u>continuously</u> for 8 years.</p> $y = 4500 e^{.05 \cdot 8}$ <p style="text-align: center;">\$ 6713.21</p>
<p><u>Option 3</u> Deposit your money with Bank C which offers 6.4% compounded <u>quarterly</u> for 30 years. $n = 4$</p> $y = 4500 \left(1 + \frac{.064}{4} \right)^{4 \cdot 30}$ <p style="text-align: center;">\$ 30,231.34</p>	<p><u>Option 4</u> Deposit your money with Bank D which offers 7.5% interest compounded <u>annually</u> for 30 years. $n = 1$</p> $y = 4500 \left(1 + \frac{.075}{1} \right)^{1 \cdot 30}$ <p style="text-align: center;">\$ 39,397.30</p>

option 4 is the best!