Name:

U3IF3 Review: Solving Exponential Growth and Decay Problems 4440

Period

$$A(t) = Pe^{rt}$$

$$y = a_0 \left(\frac{1}{2}\right)^{\frac{t}{h}}$$

$$A(t) = a_o (1 \pm r)^t$$

r = rate as a decimal

$$a_0 = initial amount$$

e = euler's constant on your calculator

t = time

h = half life time

P = principal

1. Write a formula that represents the average growth of the population of a city with a rate of 7.5% per year. Let x represent the number of years, y represent the most recent total population of the city, and A is the city's population now. What is the expected population in 10 years if the city's population now is 22,750 people?

$$r=0.075$$
  
 $y=A(1+.075)^{X}$ 

X = 10A = 22,750

y=5667.83

> 5668 people

2. Suppose the value of a computer depreciates at a rate of 25% a year. Write a formula to represent this model. Determine the value of a laptop computer two years after it has been purchased for \$3,750.

$$Y = .25$$
  
 $X = 2$ 

$$X = 2$$
  
 $A = 3,750$   $Y = 3750 (1-.25)^{3}$   $+ 2109.38$ 

3. In 2012 New Zealand had a population of about 4,444,444 million people with an average growth rate of 0.83%. In

what year will New Zealand break the 7 million person barrier?

V=4444441(1+.0083)

7,000,000 = 4,444,444 (1.0083) log1.0083 \$ 1.575 =  $\times$  \$0.204 4. A researcher estimates that the initial population of honeybees in a colony is 500. They are increasing at a rate of 14% per week. What is the expected population in 22 weeks?

> Y=A(1+r)x Y = 500(1+.14) = 8930.519

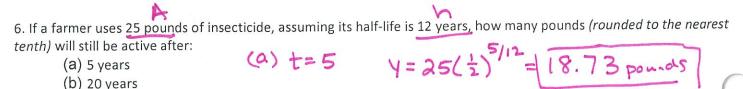
5. Radioactive gold 198 (198 Au), used in imaging the structure of the liver, has a half-life of 2.67 days. If the initial amount is 50 milligrams of the isotope, how many milligrams (rounded to the nearest tenth) will be left over after:

(b) 1 week

+= 0.5 days

(b)  $y = 50(\frac{1}{2})^{7/2.67}$ 

Y=8.123 milligrans



- 7. Suppose a certain type of bacteria reproduces according to the model  $B = 100 e^{0.271 t}$ , where t is the time in hours.
- (a) At what percentage rate does this type of bacteria reproduce? What is he rak? V= .271
- (b) What was the initial number of bacteria?
- (c) Find the number of bacteria (rounded to the nearest whole number) after:

(i) 5 hours 
$$B = 100e^{0.271(5)} = 1938.38$$
  
 $24Ls(ii) 1 day$   $B = 100e^{0.271(30)} = 66780.75$   
 $72hs(iii) 3 days$   $B = 100e^{0.271(12)} = 2.978 \times 10^{10}$ 

9. A promissory note will pay \$30,000 at maturity 10 years from now. How much should you be willing to pay for the note now if the note gains value at a rate of 9% compounded continuously?

10. Suppose Jorge deposits \$1,500 in a savings account that earns 6.75% interest compounded continuously. He plans to withdraw the money in 6 years to make a \$2,500 down payment on a car. Will there be enough funds in his account in 6 years to meet his goal? Explain your answer.

11. Tim and Kerry are saving for their daughter's college education. If they deposit \$12,000 in an account bearing 6.4% interest compounded continuously, how much will be in the account when she goes to college in 12 years?

12. Noah invests \$3500 in an account yielding 3.75% interest compounded monthly. What will the account balance be in 2 years assuming he makes no further deposits or withdrawals?

$$V = A(1+r)^{\pm}$$

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$$V = 3500(1+.0375)^{24}$$

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