**Pre-Calculus Chapter 3 Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Exponential and Logarithmic Word Problems Per\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Complete the table below. Assume interest is being compounded continuously.

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Investment | Interest Rate | Time to Double | Amount After 5 Years |
| $35,000 | 6.2% |  |  |
| $5000 |  |  | $7,130.90 |
|  | 8.4% |  | $11,414.71 |
|  |  | 11 years | $17,539.32 |

1. In 1985, the average annual consumption of beef was about 80 lbs per person. In 2009 it was about 67 pounds. Assuming consumption is decreasing according to exponential decay, write an equation that represents the exponential decline of beef consumption. Use your model to estimate the beef consumption in 2015. After how many years, theoretically, will consumption be at 50 lbs per person?
2. The statue of Zeus at Olympia in Greece is one of the ancient Seven Wonders of the World. It is made of gold and ivory. The ivory was found to have lost 35% of its carbon-14. The half-life of carbon-14 is 5750 years. How old is the statue?
3. In 1626, Peter Munuit of the Dutch West India Company purchased Manhattan Island from the American Indians for $24. Assuming an exponential rate of inflation of 8%, how much will Manhattan be worth in 2012?
4. Under ideal conditions, a population of rabbits has an exponential growth rate of 11.7% per day. If the initial population of rabbits is 100, what will the population be in 7 days? How long will it take the population to double?
5. The half-life of a certain radioactive substance is 1.5 sec. The initial amount of the substance is 3 grams. How much of the substance is left after 1 minute?
6. A drug is administered intravenously for pain. The function $f\left(t\right)=90-52ln⁡(1+t)$, where $0\leq t\leq 4$ gives the amount of the drug in the body after t hours. What was the initial number of units of drug administered? How much is present after 2 hours?
7. If Melissa invests $8000 into a retirement account with 4% interest rate compounded monthly, how long will it take until her account grows to $15,000?
8. What interest rate compounded monthly is required for $8500 to triple in 5 years?
9. Determine how much time is required for an investment to double in value if the interest is earned at a rate of 5.75% compounded quarterly?
10. The number of N bacteria present in a culture at time t (in hours) obeys the equation $N=1000e^{0.01t}$. What will the population be in 12 hours? After how many hours will the population be 2000?
11. The rate of exponential decay of Iodine-131 is -0.087. What is the half-life of Iodine-131? Determine how long it will take 100 grams to decay to 10 grams?
12. The population of a colony of mosquitoes obeys the law of exponential growth. If there are 1000 mosquitoes initially, and there are 1800 after 1 day, what is the size of the colony after 3 days? How long before there are 10,000 mosquitoes in the colony?
13. The half-life if radium is 1690 years. If 10 grams are present now, how much will be present in 50 years?
14. Cassie has just inherited a diamond ring appraised at $5000. If the diamonds have appreciated in value at an annual rate of 8%, what was the value of the ring 10 years ago when the ring was purchased?