**Unit 4B Review Sheet- Exponential Functions**

**Topics to Study**

* Graphing Exponential Functions
* Interpreting Linear and Exponential Regression Equations
* Applications of Exponential Decay
	+ Population Decline
	+ Depreciation
	+ Half-life
* Applications of Exponential Growth
	+ Population Growth
	+ Compound interest
	+ Bacteria Growth

**Formulas to know:**

Exponential Function: **y = a (b)x**

General formula for exponential growth: **y = a (1 + r) x**

General formula for exponential decay: **y = a (1 - r) x**

Compound Interest: **A = P ( 1 +** $\frac{r}{n} ) $**nt**

 Half- life: ****

1. Which is the best investment if the money in each case is invested for three years?
	1. $5,000 at 8% compounded monthly
	2. $5,000 at 8.2% compounded annually
	3. $5,000 at 8.1% compounded semiannually
2. The population of a bacteria culture triples after 1.5 hours. An experiment begins with 620 bacteria. Determine the number of bacteria after
	1. 3 hours c. 10 hours e. 3 days
	2. 6 hours d. 1 day f. 1 week
3. The half-life of a radioactive material is about 2 years. How much of a 5-kg sample of this material would remain after
	1. 4 years b. 3 years c. 5.5 years d. 18 months
4. The population of Littleton is currently 23,000. Assume that Littleton’s exponential growth rate is 2% per year.
	1. Copy and complete the table by predicting the population for the next six years.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time (years) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Population | 23,000 |  |  |  |  |  |  |

* 1. Graph the data.
	2. Create the equation to model the equation.
	3. Use your equation to predict the population in 10 years.
	4. Use your graph to estimate how long it will take the population will reach 30,000.
	5. Predict the population of Littleton after 10 years if the growth rate is 3%.
1. The half-life of caffeine in a child’s system when a child eats or drinks something with caffeine in it is 2.5 hour. How much caffeine would remain in a child’s body if the child ate a chocolate bar with 20 mg of caffeine 8 hours before?
2. A radioactive form of uranium has a half-life of 2.5 x 105 years.
	1. Find the remaining mass of 1-gram sample after t years.
	2. Determine the remaining mass of this sample after 5000 years.
3. The half-life of carbon-14 is about 5370 years. What percent of the original carbon-14 would you expect to find in a sample after 2500 years?
4. An old stamp is currently worth $60. The stamp’s value will grow exponentially 15% per year.
	1. What will the value of the stamp be in 8 years?
	2. When will the value of the stamp be worth 3 times the initial value?
5. A photocopier, which originally costs $500,000, depreciates exponentially by 10% each year.
	1. What will the photocopier’s value be worth in 5 years?
	2. When will the photocopier’s value be $175,000?
6. Suppose a population of 100 rabbits doubles in size every year. How many rabbits will there be after 5 years? 10 years?
7. An investment of $8500 increases in value by 5.5% every year. How much is the investment worth after 12 years?
8. The population of a town is 500,000 and is growing by 1.2% every year. How many people can you expect in the town 5 years later?
9. A city of 20,000 people decreases every year by 6.4%. Write an equation and determine the population after 5 years, 15 years, 20 years.
10. $4000 principal earning 3%, compounded semiannually, after 7 years.