**3-1 and 3-2 Word Problem Practice**

***Exponential Functions / Logarithmic Functions***

**1. FINANCIAL LITERACY** Suppose Jamal has a savings account with a balance of $1400 at a 4% interest rate compounded monthly. If there are no other deposits or withdrawals, what will be Jamal’s account balance in three years?

**2. BIOLOGY** Suppose a certain type of bacteria reproduces according to the model *P*(*t*) = $100e^{0.271t}$, where *t* is time in hours and *P*(*t*) is the number of bacteria.

 **a.** Determine the growth rate.

 **b.** What was the initial number of bacteria?

**3. FINANCAL LITERACY** You have $1000 to put into the bank. One bank offers a 5.7% interest rate compounded monthly. Another bank offers 5.6% compounded continuously. Which would you choose to make the most money after 2 years? After 5 years? Explain.

**5.** If your precalculus teacher offers to give you 1 second of homework for the first week of school and double the amount of homework each week until the end of the school year (i.e. 2 seconds the second week), should you say yes? Explain

**1. SEISMOLOGY** The Richter scale measures the magnitude *M* of an earthquake *M* = 0.67 log (0.37 *E*) + 1.46, where *E* is the energy released by the earthquake in kilowatt hours.

 **a.** If the amount of energy released is 1 million kilowatt hours, what is the reading on the scale?

 **b.** If an earthquake has magnitude 3.0, use your answer to part **a** to predict the amount of energy released.

 **c.** How much more energy is released in an earthquake of magnitude 8.0 than of magnitude 3.0?

**2. INVESTING** The annual growth rate for an investment can be found using *r* = $\frac{1}{t}$ln $\frac{P}{P\_{0}}$, where *r* is the annual growth rate, *t* is time in years, *P* is the present value, and $P\_{0}$ is the original investment. If the original investment was $2500 in 2002 at a rate of 6.5%, in what year could you withdraw $10,000?

**3. POPULATION** The population *P* of a certain city in any year *t* since 2010 is given by the formula
*P* = –100 ln *t* + 50,000.

 **a.** Is the population growing or shrinking?

 **b.** What is the population in 2010 and 2025?

 **c.** Will the population of the city ever reach zero if the trend continues? How do you know?

**4. BIOLOGY** A certain strain of bacteria has a
population that can be approximated by the formula
*P* = 50 log 3.2*t*, where *P* is the population and *t* is the time elapsed in days.

 **a.** Complete the table below. Round to the nearest whole number.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***t*** | 1 | 2 | 3 | 5 | 10 | 15 | 30 |
| *p* |  |  |  |  |  |  |  |

 **b.** If the initial population is 25 bacteria, on which day will the population triple?

**5. FINANCIAL LITERACY** The doubling time *t*, or the amount of time it takes for an investment to double, is given by *t* = $\frac{ln 2}{k}$, where *k* is the interest rate written as a decimal. If Tara’s parents invested $5000 in an account that earns 4.5% interest compounded continuously, will the investment double in 5 years? If not, what interest rate do they need?

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**3-2 Practice**

***Logarithmic Functions***

**Evaluate each expression.**

 **1.** $log\_{7} 7^{3}$ **2.** $log\_{10}$ 0.001 **3.** $log\_{8}$ 4096

 **4.** 2 ln $e^{5}$ **5.** $9^{log\_{9} 18}$ **6.** $log\_{8}$ 32

 **7.** $log\_{6}$ 216 **8.** $e^{ln 0.014x}$**9.** $log\_{12}$ 144

**13. INVESTMENTS** The annual growth rate *r* for an investment can be found using *r* = $\frac{1}{t}$ln $\frac{P}{P\_{0}}$, where *t* is time in years, *P* is the present value, and $P\_{0}$ is the original investment. An investment of $4000 was made in 2005 and had a value of $7500 in 2010. What was the average growth rate of the investment?