2.14 Logarithmic Function Context and Data Modeling

AP Precalculus Name: _____ **CA #1**

Instructions: Use the information given to answer the questions. Round to nearest thousandth.

1) People can use the formula below to determine future populations (*N(t)*) of cities. N_0 represents the initial population, *r* is the rate of population growth, and *t* is the time in years.

$$N(t) = N_0 e^{rt}$$

a) What would the population be of Rochester, NY be in 10 years if there are currently 210,000 people, with a population growth rate of 1.2%.

b) What growth rate would Rochester, NY need to achieve a population of 250,000 people in 30 years?

Instructions: Use the data provided to find a regression equation and answer the questions.

2) The amount bacteria (in thousands) found on the beach has been steadily declining. Scientists want to create a regression model to show the number of bacteria as a function of years.

Year	1	2	3	4
Bacteria (in thousands)	9.9	7.8	6.7	5.8

a) What's a logarithmic regression equation that could model this situation?

b) How many years until there are 2 thousand bacteria in a sample on the beach?

c) How many bacteria can be found in a sample after 6 years?

3) Scientists are studying the revitalization efforts to restore the wolf population in Wyoming. Each year they find how many wolves there are as an average of the previous 12 months.

Year	2	5	6	8
Average Wolves	21.6	28.9	30.3	32.6

a) What's a logarithmic regression equation that could model this situation?

b) How many wolves can we predict there will be in year 10?

c) How many years for there to be 50 wolves on average for the year?

Answers

1) A) 236,774 people
   B) 0.5%

2) A) $f(x) = 9.858 - 2.939 \ln x$
   B) x = 14.6, so 15 years
   C) 4.6 thousand bacteria

3) A) $f(x) = 16.106 + 7.933 \ln x$
   B) 34.372, so 34 wolves
   C) 70.703, so 71 years.