MATH 1314.003-Spring 2002 Qualitative Assessment 3 5 Name: Key

Answer the question relating to the scenario below, writing a complete sentence to explain each step taken. Credit is awarded for correctness of mathematics (10 points), correctness and completeness of explanations (15 points) and neatness and grammar (5 points). You may use calculators, notes, books, but not the paper of another person on this assessment. (Good Luck!!)

Scenario: The population, N, of a colony of bacteria is modeled by the equation $N = 100*e^{kt}$, where t is the time in days and k is an unknown number.

Question 1: What is the original population of the colony, i.e., after 0 days?

Let $t=0$ & find N. $N = 100 \cdot e^{K \cdot 0} = 100 \cdot e^{0}$

$= 100 \cdot 1 = 100.$

Since any base to the zero power is one.

There was originally 100 bacteria in the colony.

Question 2: The population doubles to twice the size of the original population after 5 days. What is the value of k for this model?

If the population doubles then will be $N = 200$ bacteria and $t = 5$.

So $\frac{200}{100} = \frac{100}{100} \cdot e^{K \cdot 5}$

So $2 = e^{K \cdot 5}$

$\ln 2 = \ln e^{K \cdot 5} = K \cdot 5$

$.1386 = \frac{\ln 2}{5} = k$

$= .139$ to 3 decimal places.

Question 3: When will the population of colony be 4 times the original population?

Then $N = 400$, t is unknown. So we need to solve $400 = 100 \cdot e^{.139 \cdot t}$ for t.

$4 = e^{.139t} \rightarrow \ln 4 = .139t \quad t = \frac{\ln 4}{.139} = 10.$ It will take 10 days for the popn to quadruple.