Name: _____

6.5.D2 ~ Logarithms & Exponential Models

Fill in the table below, assuming that t is measured in years. *Round k and b values to 4 decimal places.*

	Convert		Growth or Decay?	Non-Continuous % Rate	Continuous % Rate
	$Q = a(b)^t$	$Q = ae^{kt}$			
1.		$Q = 25e^{0.053t}$			
2.	$Q = 6000(0.85)^t$				
3.	$Q = 5(1.12)^t$				
4.		$Q = e^{-0.775t}$			

5. The population of Delhi, India, can be modeled by the function $P(t) = 9817(1.031)^t$.
   a. Convert to the form $P(t) = ae^{kt}$. *Round the value of k to 4 decimal places.*
   b. What is the annual/non-continuous rate?
   c. What is the continuous rate?

6. The growth of a certain bacteria in a culture is given by the model $A(t) = 500e^{0.0277t}$.
   a. Convert to the form $A(t) = a(b)^t$. *Round the value of b to 4 decimal places.*
   b. What is the annual/non-continuous rate?
   c. What is the continuous rate?

7. A population is 25,000 in year t = 0 and grows at a continuous rate of 7.5% per year. By what percent does the population increase each year? *Round the annual/non-continuous rate to 2 decimal places.*

8. The number of bacteria present in a culture after t hours is given by the formula $N = 1000e^{0.58t}$.
   a. What is the doubling time?
   b. What is the hourly (non-continuous) rate of growth? *Round to 2 decimal places.*

9. A population doubles in size every 15 years.
   a. Find the value of b. *Round the value of b to 4 decimal places.*
   b. What is the annual/non-continuous rate?
   c. What is the continuous rate?

10. A population grows exponentially from 400 people in 2009 to 1500 people in 2016.
    a. Find the value of b. *Round the value of b to 4 decimal places.*
    b. What is the annual/non-continuous rate?
    c. What is the continuous rate?

11. According to the U.S. Bureau of the Census, in 2000 there were 35.3 million residents of Hispanic origin living in the United States. By 2010, the number had increased to 50.5 million.
    a. Find the value of b. *Round the value of b to 4 decimal places.*
    b. What is the annual/non-continuous rate?
    c. What is the continuous rate?

12. How long, to the nearest tenth of a year, will it take $1000 to double at nominal rate of 8% interest compounded quarterly? *Write a function equation using the compound interest formula; solve using logarithms.*

    a. What is the annual growth rate? *Hint: Calculate b (from your compound interest function equation); $(b-1) \times 100$*

    b. What is the continuous growth rate?