Math 122 Worksheet 3

Show all work for full credit. All decimals should be correct to 3 decimal places.

1. Put the function \( P = 2800(1.37)^t \) in the form \( P = P_0 e^{kt} \).

Fill in the blank: Annual Rate:_________ Continuous Rate: _________
Give your answer as a percent.

2. What interest rate, compounded annually, is equivalent to a 18.4\% rate, compounded continuously?

3. If a population grows exponentially from 400 people in 2009 to 1500 people in 2016, what is the annual (not continuous) percentage rate of growth? Give your answer as a percent.

4. If a substance grows exponentially from 800 grams to 2200 grams in 24 hours, determine the doubling time of the substance. Give units.

5. Solve for \( x \).
   a. \( 12 + 5(3^{x-4}) = 48 \)
   b. \( 4e^{-0.85x} - 13 = 32 \)
6. The size of a bacteria colony triples every 18 minutes. If the bacteria is growing exponentially, how long will it take the number of bacteria to be 5 times the original amount? Give units.

7. A radioactive substance decays exponentially. If 65 grams was present in 2004 and 26 grams was present in 2010, how many grams will be present in 2018?

8. In 2015, a museum receives a letter from a man claiming to have an original masterpiece painted by Picasso in 1908. If the half-life of Carbon-14 is 5730 years, 
   a. What percentage of the original Carbon-14 would remain if the painting were painted in 1908?
   b. If you discover that 99.6% of the original Carbon-14 remains, in what year was the painting actually painted?