PROBLEM SET #8 **NAME:**_____

Math 196L – 001 (Spring 2017)

Instructions: Read each problem. Write a sentence or two about the approach you might take to solve each problem. Draw a picture to illustrate the scenario. Write a formula that might be needed to help set up or solve the problem.

We did not get to this one last week, so we will repeat it this week.

Prior to class.

A) Write the 2 different exponential functions in general terms. Write a statement when you use each one.

B) Write the general formula of an equation of a line.

C) Write the 3 properties of Log functions.

D) Write the 3 properties of exponential functions.

1. What is the relationship between the periodic model and continuous model of an exponential function?

2. In the past decade, alarm has spread over several parts of our country concerning radon, a highly radioactive gas, which can have severe deleterious effects on people who remain in contact with it for prolonged periods. This gas, which is formed by the disintegration of radium, is found in the soil over most of the earth. It can seep through foundations of homes and office buildings and since it is colorless and odorless, detection by the natural senses is impossible. Radon detection kits are available at most hardware stores. The chief use of radon is in the treatment of cancer by radiotherapy. F.O. Dorn discovered one of the most common forms of radon, radon 222, in 1900. He called it radium emanation. We shall investigate this form of radon.

   Suppose radon is detected at a local elementary school on Wednesday, April 1 at 9 a.m. Students and personnel are immediately moved to a different location, and steps are taken immediately so that no additional radon contaminates the area.

   Let t be the time (in days) after April 1 at 9 a.m. and let Q be the amount of radon present (units pCi/l – pico Curies per liter) at the school at time t. The following table shows the amount of radon present at various times.

t	1.2	2.6	3.1	4.1	8.5
Q	40.15	31.15	28.44	23.71	10.64

   (A) Write a formula for the function that best models the data. Explain why the model used is appropriate.

   (B) By what percentage does the radon decrease each day? How much radon is detectable at 9 a.m. on April 1?

   (C) Radon levels less than 4 pCi/l are considered safe. How many days will it take for this site to be considered safe?

   (D) Will the amount of radon on this site theoretically ever reach zero? Practically? Explain.

   (E) Suppose that the most sensitive current technology can only measure levels of 0.01 pCi/l of radon in a given area. In how many days will the radon on this site be undetectable (nearest day and hour)?

   (F) What is the half-life of radon?

3. A car is purchased for \$34,000. The car loses value in the following three ways given below. Write an equation to express the value of the car t years after purchase.

   a) The car depreciates at a yearly rate of 14.5%.

   b) The car loses value about \$7,000 per year.

   c) The car values declines at a relative rate of 16% per year.

4. You and a friend plan to purchase cars in December. The initial value of your car will be \$40,000 and will depreciate 18% each year. The initial value of your friend's car will be \$18,500 and will depreciate 12% each year. You agree to exchange cars when their values are equal.
   (A) How long do you need to wait? (to the nearest **month**) What is the value of your car?

   (B) What would your depreciation rate have to be in order for the values of the cars to match at the end of 7 years? (assume your friend's car depreciates 12% each year)

5. Write the following expressions with no terms in the exponent and no negative exponents. Goal: Write each with a coefficient and an exponential base. Cb^x

   A) 2^{x+3} B) 3^{2x-1} C) $\frac{1}{3^{x-3}}$ D) $2(5^{-x+2})$

6. Solve the following exactly:

   (A) $\log_2(1-x)+\log_2(4-x)=3$ (B) $e^{2x}-4e^x=5$

   (C) $18^x=3^{2x-1}$ (D) $2\log_4(3x+1)+4=9$

   (E) $\log(x)-2\log(x-3)=1$ (F) $10^{x+2}=4e^{3-x}$

7. Suppose that the terminal point determined by t is the point (a,b) on the unit circle. Find the terminal point determined by each of the following. (Assume $0<t<\frac{\pi}{2}$) If it can't be determined state why.

   (A) $-t$

   (B) $5\pi-t$

   (C) $-17\pi+t$

   (D) $t-\pi$

   (E) $\frac{3\pi}{2}+t$