Written Homework 7 – sections 5.6 - 5.7 Name______________________________

1. Suppose you can invest money in various accounts (A, B, C, etc.) Give exact answers and decimal answers for the following. When giving a percent, include two decimal places.

A. In account A the annual interest rate is 7.6% with interest compounded quarterly. If you invest $21,000, how much will be in the account at the end of 12 years? What is the effective yield?

B. In account B the interest is compounded continuously. If you invest $24,000, what annual interest rate would produce the same balance as account A at the end of 12 years?

C. In account C your money would double in 18 years. If interest is compounded monthly, what is the annual interest rate?

2. In 1997, tuition at four-year public universities was $2,360 per year. (This is an average value.) In 1998, that figure rose to $2,430 per year.

A. If tuition increased linearly, write a formula for the tuition as a function of years since 1997. Use your function to estimate the tuition in 2006.

B. If tuition increased exponentially, write a formula for the tuition as a function of years since 1997. Use your function to estimate the tuition in 2006.

Note: The average tuition in 2006 was actually $4,102.

3. The amount of ozone, P, in the atmosphere is decaying exponentially at a continuous rate of 0.23%. Write a formula for P as a function of time where $t = 0$ corresponds to 2008. Use your formula to determine the time it will take for 35% of the ozone to disappear. (Exact answer and decimal answer)

4. A particular lake is stocked with fish. Suppose the population grows according to the model $P(t) = \dfrac{10,000}{1+9e^{-t/5}}$ where t is measured in months since the lake was initially stocked.

A. How many fish were used to stock the lake?

B. In this model, it can be shown that the population is increases the fastest when the population is 5000. Find the time when that will occur.

C. In the long run, how many fish could this lake sustain according to this model? What calculation is needed to determine this value?

D. Sketch the function. What graphical features correspond to your answers to parts B and C?

5. Suppose the “life expectancy”, *T*, of a nonrenewable resource satisfies the model $Q = \frac{Q_0}{k}\left(e^{kT} - 1\right)$ where Q is an estimate of the total amount of the resource available, Q_0 is the amount of the resource consumed in the year corresponding to $t = 0$, and *k* is the growth rate of annual consumption.

A. Solve for *T*.

B. In 1999, the world-wide consumption of copper was 12.6 million metric tons with an approximate growth rate of 2.4% per year. At the time it was believed that the total copper reserve was 650 million metric tons. Use your answer to part A to determine the life expectancy of copper and in what year copper will be depleted.