H Math 3 Exponential/Logarithmic Modeling Notes Name _____

I. Exponential Growth/Decay Models

a) Growth	b) Decay

*Example:

1. A house that costs $200,000 has been shown to appreciate 3% each year. Write a function that models the growth over time. Find the value of the house after 10 years.

2. Ian's new Mercedes cost him $75000. From the moment he drives it off the lot, it will depreciate by 20% each year for the first five years. Write a function that models the car's depreciation. What is the car's worth at the end of 5 years? When is the car worth $60,000?

3. Jackie is 60 inches and going through a growth spurt. For the next year, her growth will increase by 1% each month. Write a function modeling Jackie's growth over the next year and find her height at the end of the year.

II. Formulas for compounding interest.

a) For "n" compoundings per year:	Compounding Continuously

*Example:

1. A sum of $10,000 is invested at an annual rate of 8%. Find the balance in the account after 5 years if:
   a) Compounded quarterly.

   b) Compounded monthly.

   c) Compounded continuously.

   d) How long will it take your money to double when compounded continuously?

2. In 1990, the population of Africa was 643 million and by 2006 it had grown to 906 million. Assume the population is modeled by **continuous** growth.
   a) Find the exponential growth function that models the data for t years after 1990. (Hint: find the growth rate first)

   b) By which year will Africa's population reach 2000 million, or two billion?

III. Half-life / Doubling / Tripling - etc

*Example:

1. Strontium-90 is a waste product from nuclear reactors. As a consequence of fallout from atmospheric nuclear tests, we all have a measurable amount of strontium-90 in our bones.

   a) Suppose that a nuclear accident occurs and releases 60 grams of strontium-90 into the atmosphere. The half-life of strontium-90 is 28 years, meaning that after 28 years a given amount of substance will have decayed to half the original amount. Find the exponential decay model for strontium 90.

   b) How long will it take for strontium-90 to decay to a level of 10 grams?

2. Polonium-210 has a half-life of 140 days. Suppose a sample of this substance has a starting mass of 300 mg.
   a) Find the function that models the amount of the sample remaining at any time t days.

   b) Find the mass remaining after one year.

   c) How long will it take for the sample to decay to 200mg?

3. The number of bacteria on the desk triples every 5 minutes. If the desk starts with 300 bacteria, how much will there be on the desk after 8 hours?