

Honors 125
Homework #3

Name _____
Due Tuesday, October 13, 2009

Be sure to show all work neatly.

1. The amount of the antidepressant Prozac, in mg, in the body t hours after taking a standard dose is modeled by the function $P = 20e^{-0.19t}$.
 - a) How much Prozac is in a standard dose?
 - b) What percent of Prozac leaves the body every hour?
 - c) Find the half-life of a dose of Prozac.

2. In 1990 the population of Mexico was about 84 million people and growing at an annual rate of about 2.6%.
 - a) Give a formula for $P(t)$, the population of Mexico (in millions) t years after 1990.
 - b) What is the **continuous** growth rate of the population of Mexico?

 - c) Write an equation for the population of Mexico (in millions) t years after 1990 using the continuous growth rate.
 - d) If the 1990 growth rate continues, what is the predicted population of Mexico in 2025? (Use either function above.)
 - e) When would the population be expected to reach 100 million people?

3. For the following problems, assume that you know of an investment that pays 4.5% interest per year.
 - a) Find a model for the value of an investment of \$3500 after t years, if the interest is compounded monthly.
 - b) Find the value of the investment above after 5 years.
 - c) Find a model for the value of an investment of \$3500 after t years, if the interest is compounded continuously.
 - d) Find the value of the investment in part c) after 5 years.
 - e) How long will it take for the investment in part c) to triple in value?

4. In 1980 there were about 190 million vehicles (cars and trucks) on the road in the US. The number of vehicles has been growing at a **continuous** rate of 4.5% per year.
- Give a formula for $V(t)$, the number of vehicles (in millions) in the US t years after 1980.
 - What is the **annual percentage** rate of increase in the number of vehicles?

 - Write an equation for the number of vehicles (in millions) in the US t years after 1980, using the **annual percentage growth rate**.
 - If the 1980 growth rate continues, what is the predicted number of vehicles on the road in the US in 2020? (Use either function above.)
 - In what year would the number of vehicles be expected to reach 250 million?
5. Section 2.3 (page 152), #8, 20, 22, 24, 54.