

Name: _____

MA2 Exponential and Logarithmic Applications Sheet

- 1) It is projected that t years from now the population, P (in millions), of a certain country can be represented by the function $P(t) = 50e^{0.02t}$.
 - a) At what rate will the population be changing 10 years from now?
 - b) At what percentage rate will the population be changing with respect to time?
- 2) Public health records indicate that t weeks after the outbreak of a certain influenza, approximately $O(t) = \frac{80}{4 + 76e^{-1.2t}}$ thousand people had caught the disease.
 - a) At what rate was the disease spreading at the end of the second week?
 - b) At what rate was the disease spreading at the end of the third week?
- 3) Assume that the amount of a radioactive substance, in grams, present at time t , in years, is given by the function $A(t) = 500e^{-0.25t}$. Find the rate of change of the quantity present when
 - a) $t = 4$
 - b) $t = 6$
- 4) The consumer demand for a certain camera is $D(p) = 5000e^{-0.02p}$ cameras per month when the market price is p dollars per camera. Determine the market price that will result in the greatest customer expenditure where consumer expenditure $E(p) = p \cdot D(p)$.
- 5) Suppose that the percentage of alcohol in the bloodstream t hours after consumption is given by $C(t) = 0.2te^{-\frac{t}{2}}$
 - a) What is the maximum level of alcohol in the bloodstream?
 - b) When does the maximum level of alcohol in the bloodstream occur?
- 6) The function $f(x) = \frac{1}{\sqrt{2\pi}} \cdot e^{-\frac{x^2}{2}}$ is known as the *standard normal probability density function* and plays a vital role in probability and statistics. The graph of this function is the well-known “bell-shaped” curve that is used by physical and social scientists to describe distributions of IQ scores and measurements on large populations of living organisms, the velocity of a molecule in a gas, and numerous other phenomena.
 - a) Determine where the function is increasing and where the function is decreasing.
 - b) Determine where the function is concave up and where it is concave down.
 - c) Find all relative extrema.
 - d) Find inflection points.
 - e) Sketch $f(x)$.