1. The demand for a certain product is given by the function, $p = 500 - 0.5e^{-0.004x}$, where $x$ is the demand and $p$ is the price.

   (a) Find the price if the demand is for 1000 units.
   (b) Find the demand if the price is $350.
   (c) Graph the function and sketch it neatly on your paper with $x$ (demand) on the horizontal axis and $p$ (price) on the vertical axis.
   (d) What price creates no demand?
   (e) What is the demand when the price is $0$?

2. The yield ($V$) in millions of cubic feet of lumber per acre for a forest at age $t$ years is given by $V = 6.7e^{-48.1t}$. Use a graphing calculator to graph the function for $t = 0$ to 200 years. (Use a maximum y-value of 10.)

   (a) Determine the horizontal asymptote of the function and explain its meaning in the context of the problem.
   (b) Find the time necessary to obtain a yield of 1.3 million cubic feet of lumber.

3. The percent of American males between the ages of 18 and 24 who are less than or equal to $x$ inches tall is given by $m(x) = \frac{100}{1 + e^{-0.6114(x-69.71)}}$.

   (a) What percent of these American males are under 6 feet tall?
   (b) What is the median height of these American men (the height that 50% are less than!)?

   The percent of American females between the ages of 18 and 24 who are less than or equal to $x$ inches tall is given by $f(x) = \frac{100}{1 + e^{-0.6661(x-64.51)}}$.

   (c) What percent of these American females are under 6 feet tall?
   (d) What is the median height of these American women (the height that 50% are less than!)?
4. A conservation organization releases 100 animals of an endangered species into a game preserve. The organization believes that the preserve has a carrying capacity of 1000 animals and that the growth of the herd will be modeled by the logistics curve, \[ p(t) = \frac{1000}{1 + 9e^{-0.1656t}} \], where \( p \) is the population of the herd \( t \) months after releasing the animals.

(a) How many animals are in the herd after 1 year?
(b) After how many months will the population be 500?
(c) Graph the function on a graphing calculator, sketch the graph on your paper, and interpret the meaning of the horizontal asymptote in the context of this problem.

5. At 8:30 am a coroner was called to the home of a person who had died. To estimate the time of death the coroner took the person’s temperature twice. At 9:00 am the temperature was 85.7°F and at 9:30 am the temperature was 82.8°F. The coroner uses this formula and the two temperatures to find the time of death: \[ t = -2.5 \ln \left( \frac{T - 70}{98.6 - 70} \right) \], where \( t \) is the time in hours elapsed since the person died and \( T \) is the temperature of the person’s body at that time, assuming their temperature was 98.6°F at death and the room is 70°F.

(a) Use the 9:00am temperature and estimate the time of death (not elapsed time).
(b) Use the 9:30am temperature and estimate the time of death. Are the answers fairly close?
(c) What will the temperature of the body be after 24 hours?
(d) When will the temperature of the body drop to 60°F? Use the graph to explain.