

# PRECAL HONORS

Name \_\_\_\_\_

## 4.5 – WORD PROBLEMS

1. Iodine 131 is a radioactive material that decays according to the function  $A(t) = A_0 e^{-0.087t}$ , where  $A_0$  is the amount present initially and  $t$  is the time in days. How long will it take for a sample of 100 grams to decay to 70 grams?

2. The number of grams of bacteria in a culture after  $t$  hours is given by  $A(t) = \frac{1000}{1 + 32.33e^{-0.439t}}$ .

[a] What is the mass of the bacteria after nine hours?

[b] How long does it take the bacteria to reach a mass of 700 grams?

3. A pan is removed from an oven and begins to cool. Its temperature is modeled by the formula  $F(t) = 70 + 380e^{-0.1004t}$ , where  $t$  is in minutes.

[a] What is the temperature of the pan after ten minutes?

[b] How long does it take for the pan to reach a temperature of 135°F?

4. The relationship between sound level and sound intensity is  $L = 10 \cdot \log \frac{I}{10^{-12}}$ , where  $L$  (sound level) is measured in decibels and  $I$  (sound intensity) is measured in watts per square meter.

[a] Find the sound level of a noise that has an intensity of  $10^{-8}$  watts per square meter.

[b] What is the intensity of a sound that registers 110 decibels?

5. The pH of a solution is found by the formula  $pH = -\log(h)$ , where  $h$  is the hydrogen ion concentration of the solution (moles of hydrogen per liter).

[a] What is the pH of a solution with a hydrogen ion concentration of  $2.3 \times 10^{-5}$ ?

[b] Apple juice has a pH of 2.9, and drinking water has a pH of 8. The hydrogen ion concentration of apple juice is how many times that of drinking water?