Quiz 6

MAT 265, Spring 2017

Name:

1. One product of nuclear reactions is Plutonium-239. After 15 years, we measure sample of Pl-239 and find that it has lost 0.043% of its initial size. What is the half-life of this isotope of plutonium?

2. Suppose that a sample of charcoal contains 0.1% of the amount of C-14 that was initially present. Find the age of the sample.

3. A pie is removed from an oven with an internal temperature of 300° F. Three minutes later its temperature is 200° F. If the temperature in the room is 70°, how long will it take the pie to reach a temperature of 75°?

4. One model for a population of animals that fluctuates with the seasons is

$$\frac{dP}{dt} = (k \cos t)\, P.$$

   Find the general solution to this differential equation.

5. Challenge: Consider a system of two connected tanks. Tank A begins with 25 pounds of salt dissolved in 50 gallons of water, and Tank B contains 50 gallons of pure water. Two gallons per minute of solution flow from A to B, and two gallons per minute also flow in the reverse direction, from B to A. Three gallons per minute of pure water is pumped into Tank A, while three gallons per minute of the mixed solution is pumped out of Tank B. Find a system of differential equations governing these mixtures.