Math 1450, Honor Calculus Practice3, Fall 2016.

September 14, 2016

PSID: _____   Name: _____

1. (From 3.7 Exercise 35 in textbook) In the study of ecosystems, predator-prey models are often used to study the interaction between species. Consider populations of tundra wolves, given by $W(t)$, and caribou, given by $C(t)$, in northern Canada. The interaction has been modeled by the equations

$$\frac{dC}{dt} = aC - bCW \qquad \frac{dW}{dt} = -cW + dCW$$

   (a) What values of $\frac{dC}{dt}$ and $\frac{dW}{dt}$ correspond to stable populations?

   (b) How would the statement The caribou go extinct be represented mathematically?

   (c) Suppose that $a = 500, b = 10, c = 500, d = 1$. Find all population pairs C, W that lead to stable populations. According to this model, is it possible for the two species to live in balance or will one or both species become extinct?

2. (From 3.8 Exercise 13 in textbook) A roast turkey is taken from an oven when its temperature has reached 185°F and is placed on a table in a room where the temperature is 75°F.

   (a) If the temperature of the turkey is 150°F after half an hour, what is the temperature after 45 minutes?

   (b) When will the turkey have cooled to 100°F?