Name _____ Section A36

MA 103, Quiz #10 19 November 2007

Instructions: You have 15 minutes to complete this quiz. The quiz is worth 25 points. You are allowed use of your books, notes, and laptop, but you are not permitted to use wireless networks (i.e., no Internet, e-mail, IM, or other forms of communication). Good luck!

1. As winter approaches, mice go in to the barracks seeking warmth, lured by the irresistible smell of unsecured boodle. The birth rate of the mice is 28% per week, and DPW kills 100 mice a week. As the S4 for your company, your TAC has asked you to model whether the company will have to take extra steps to control the population. The acceptable number of mice is 400 in the entire barracks (they clean enough of the boodle crumbs without being much of a nuisance or health hazard). As of today there are 400 mice in the barracks.

   (a) Using "the big 5," model the mouse population in the barracks as an IVP (initial value problem).

   (b) Find the equilibrium point(s).

   (c) Find an analytic equation that models the population.

   (d) What happens to the mouse population over the long term?

   (e) How many mice does DPW need to kill a week to keep the population at 400?

2. Every week, 10% of Colbert Nation falls victim to bear attacks. Fortunately, 900000 people join the heroes of Colbert Nation each week. Over the long term, what will happen to the population of Colbert Nation?

3. Verify that $t_n = (0.9)^n 32 + 40$ is a solution to the recursion equation

$$t_n = 0.9t_{n-1} + 4.$$