Math 10B, Quiz 9

1. (9 points) Suppose you consume some alcohol. Your body (specifically your liver) will naturally metabolize the alcohol and turn it into other substances. The rate at which your body metabolizes alcohol is proportional to the amount of alcohol currently in your system. In other words, the rate at which your body gets rid of alcohol is proportional to the amount of alcohol in your body.

   (a) Suppose you are drinking alcohol at a rate of 2 milliliters per second. Let $A(t)$ represent the number of milliliters of alcohol in your body at time t (where t is measured in seconds). Write a differential equation satisfied by A.

   (b) Suppose the constant of proportionality in your differential equation is -1 and that initially you have 100 milliliters of alcohol in your body. Find $A(t)$.

   (c) With the same assumptions as in part (b), what is the amount of alcohol in your body as $t \to \infty$?

2. (2 points) Consider the recurrence relation $a_n = -a_{n-1} + 5a_{n-2}$ with initial conditions $a_0 = 3$ and $a_1 = 4$. True or false: the formula $a_n = n^3 + 3$ is a solution.

   ◯ True ◯ False

3. (2 points) The differential equation $y' = y + ye^t$ is separable.

   ◯ True ◯ False

4. (2 points) Have a good spring break. (Hint: both answers are correct)

   ◯ True

   ◯ False