

MATH 3250
QUIZ 0
01/23/2017

Honor Pledge: On my honor as a student, I have neither given nor received aid on this quiz.

Name:

Signature:

- (1) In a rote memorization exercise, a student is asked to memorize a list of M three digit numbers. We'll denote the number of items memorized by time t by $L(t)$. One model for memorization says that

$$\frac{dL}{dt} = k(M - L)$$

where k is a positive constant, so that rate of memorization is proportional to the number of items still to be memorized.

(a) The value of the constant k is different for different people. If A memorizes quicker than B, whose k value is greater? (1)

(b) What initial condition corresponds to the assumption that initially no items have been memorized? (2)

(c) Suppose we want to modify our model to include the fact that some items are forgotten after being initially memorized. If we assume that the "rate of forgetting" is proportional to the amount memorized, what new differential equation do we have for $L(t)$? (2)

(2) Using the Fundamental Theorem of Calculus, verify that

$$y = \int_0^x e^{-t^2} dt$$

is a solution of the differential equation

$$\frac{dy}{dx} - e^{-x^2} = 0.$$

(2)

(3) Let k be a constant in

$$\frac{dy}{dt} = y(y - 3) + k$$

(a) Find all equilibrium solutions if $k=0$. (1)

(b) Find all equilibrium solutions if $k = \frac{5}{4}$. (2)

(c) For what values of k will there be no equilibrium solutions? (2)