Math 2414 **Graded Homework 2 (Section 9.3)** **Fall 2019**

Instructions:

1) **Due: During the first 10 minutes of your problem session the week of Oct. 7, 2019**
2) **Assignments must be submitted in a blue book – no exceptions. Bluebooks are available at the on campus/off campus bookstore, student union, etc.**
3) **On the front cover, write the following at the top:**
   a) **TA name**
   b) **Your name**
   c) **Assignment name**
   d) **Problem session number**
4) **You may use both sides of each page, but start a new problem at the top of a new side.**
5) **Solutions must be presented neatly, completely, and with logical flow.**
6) **15% will be deducted for assignments turned in after the first 10 minutes of class.**
7) **25% will be deducted for assignments which are not neat and orderly.**
8) **15% will be deducted for assignments without your TA's name.**
9) **Assignments will not be accepted after class.**

1. Find the general solution of the DE. Write your solution explicitly.

$$y' = (xy^3 + y^3 \sin x)^2$$

2. Find the general solution for the differential equation. Leave your solution in implicit form.

$$(ye^x + 2e^x)y' = x$$

3. Solve the initial value problem. Write your solution explicitly.

$$(t^2 - 2t)\frac{du}{dt} = 2ut + t - 2u - 1$$

$$u(1) = \frac{5}{2}$$

4. Solve the initial value problem. Write your solution explicitly.

$$\frac{dx}{dt} = (9 - x)\sqrt{5 - x}$$

$$x(0) = 1$$

5. Consider the initial value problem

$$\frac{dP}{dt} = P^2 - 7P + 10$$

$$P(0) = 1$$

where P represents the population of a species (in thousands), and t represents time (in years).

a. Find the explicit solution of the initial value problem to find P as a function of t.
b. What size does the population approach in the long term? (i.e. find the limit as $t \to \infty$ of P).
c. If you could go backwards in time, what size would the population approach? (i.e. find the limit as $t \to -\infty$ of P)