Math 340 Fall 2015

Quiz **9** Ordinary Differential Equations

Name: _____ **Prof. Ron Buckmire**

ASSIGNED: Friday October 30

Time Begun: _____
Time Ended: _____ **DUE: Monday November 2**

Topic : Quasi-Linear Systems of Ordinary Differential Equations

The learning goal of this quiz is to provide you with an opportunity to combine your understanding of quasi-linear systems of DEs.

Reality Check:

EXPECTED SCORE : _____**/10** ACTUAL SCORE : _____**/10**

Instructions:

0. Please look for a hint on this quiz posted to `http://sites.oxy.edu/ron/math/340/15/`
1. Once you open the quiz, you have **30 minutes** to complete it, please record your start time and end time at the top of this sheet.
2. You may use the book or any of your class notes. **You must work alone**.
3. If you use your own paper, please staple it to the quiz before coming to class. If you don't have a stapler, buy one. QUIZZES WITH UNSTAPLED SHEETS WILL NOT BE GRADED.
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules.
5. Your solutions must have enough details such that an impartial observer can read your work and determine HOW you came up with your solution. Use complete sentences wherever possible.
6. Relax and enjoy...
7. **This quiz is due at the beginning of class on Monday November 2**, in class. NO LATE OR UNSTAPLED QUIZZES WILL BE ACCEPTED.

Pledge: I, _____, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

Math 340 Fall 2015 **SHOW ALL YOUR WORK** Quiz **NINE**

Modified from the Fall 2014 Final Exam in Ordinary Differential Equations.

1. Consider the 2-D system of quasi-linear ODEs

$$\begin{aligned} \frac{dx}{dt} &= -2x + 2x^2 \\ \frac{dy}{dt} &= -3x + y + 3x^2 \end{aligned}$$

The goal of this problem is to find and classify all the equilibrium points of the system (i.e. classify each point as either stable or unstable and describe the behavior near the point as a saddle, center, spiral sink, spiral source, improper node, etc). NO COMPUTING DEVICES ALLOWED.

(a) *2 points.* Find the Jacobian matrix of the system.

(b) *2 points.* Find the equilibrium points of the system.

(c) *6 points.* Classify all the equilibrium points of the system.