Quiz 3   ORDINARY DIFFERENTIAL EQUATIONS

Name: _____

Prof. Ron Buckmire

ASSIGNED: Friday September 11

Time Begun: _____

Time Ended: _____

DUE: Monday September 14

Separation of Variables and the Existence & Uniqueness Theorem

The learning objective of this quiz is to provide the student with an opportunity to demonstrate your understanding of the technique of separation of variables and the existence and uniqueness theorem.

Reality Check:

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

Instructions:

0. BEFORE you open the quiz, feel free to look for a hint at `faculty.oxy.edu/ron/math/340/15/`

1. Once you open the quiz, you have **30 minutes** to complete, 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.

6. Relax and enjoy...

7. **This quiz is due at the beginning of class on Monday September 14**, 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.

Adapted from Math 341 Spring 2005 Exam 1, Question 1.

1. Consider the initial value problem

$$\frac{dy}{dx} = 2xy^2, \quad y(0) = \frac{1}{c^2} \text{ with } c > 0.$$

(a) (*5 points.*) Use separation of variables to show that the one-parameter family of curves
$y(x) = \dfrac{1}{c^2 - x^2}$ are solutions to the given initial value problem when $x \neq \pm c$.

(b) (*2 points.*) Determine the **interval of definition** of the given initial value problem.

(c) (*3 points.*) For what values of the parameter c do **unique** solutions to the given initial value problem **exist**? **EXPLAIN YOUR ANSWER!**