Math 340 Fall 2015

Quiz **1** DIFFERENTIAL EQUATIONS

Name: _____

Time Begun: _____
Time Ended: _____

Friday August 28
Prof. Ron Buckmire

Topic : Introduction to Differential Equations

The idea behind this quiz is for you to get some practice classifying differential equations and thinking about key concepts and terminology from week 1.

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 on Monday August 31**, 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 EXPLAIN EVERY ANSWER** Quiz **One**

P: $\dfrac{dy}{dx} = y^2 - \epsilon$ **Q:** $t^2\dfrac{d^2x}{dt^2} + 3t\dfrac{dx}{dt} + x = 0$ **R:** $y^{(5)}(r) + 2y''(r) + y'(r) + 3\cos y(r) = \sin(\omega r)$

1. (*6 points total.*) For each of the above differential equations labeled **P**, **Q** and **R**:
(a) *3 points.* Classify each differential equation by **order**, as **linear OR nonlinear** and as **autonomous OR non-autonomous**.

(b) *3 points.* Name **the independent variable**, the **dependent variable** and any **parameters** in each differential equation.

(2) (*4 points total*) Consider Differential Equation **Q** from above,

$$t^2\frac{d^2x}{dt^2} + 3t\frac{dx}{dt} + x = 0.$$

(a) *2 points.* Show that $x(t) = \dfrac{C\ln(t)}{t}$ is a solution to Differential Equation **Q** for any value of the unknown constant C. (HINT: The product rule may be more helpful than the quotient rule here!)

(b) *1 point.* Show that $x(t) = \dfrac{D}{t}$ is a solution to Differential Equation **Q** for any value of the unknown constant D.

(c) *1 point.* Discuss the implications of part 2(a) and part 2(b) on the family of solutions to Differential Equation **Q**. How many solutions do you think exist to this differential equation and how would you describe that set of solutions? How many initial conditions would you need to obtain a particular solution to **Q**?