Math 341 Fall 2010

Quiz **1** **Differential Equations**

Name: _____

Friday September 10
Prof. Ron Buckmire

Time Begun: _____
Time Ended: _____

Topic : Introduction to Differential Equations

The idea behind this quiz is for you to get some practice solving differential equations and test your recall of key concepts.

Reality Check:

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

Instructions:

0. Please look for a hint on this quiz posted to `faculty.oxy.edu/ron/math/341/10/`
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 September 13**, 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 341 Fall 2010 **SHOW ALL YOUR WORK** Quiz **One**

1. Consider the following differential equation

$$\frac{dy}{dx} = \left(\frac{y}{x}\right)^2 + 2\frac{y}{x}.$$

(a) *1 point.* Fully classify this differential equation by **type**, **order** and **linearity**.

(b) *2 points.* Show that the given differential equation when thought of as $\frac{dy}{dx} = F\left(\frac{y}{x}\right)$ can be transformed using the transformation $u = y/x$ (i.e. $y = ux$) into a *separable* equation of the form $x\frac{du}{dx} = F(u) - u$ where $F(t) = t^2 + 2t$. (HINT: note that u is a function of x, so the right-hand side of $y = ux$ is also only a functio of x).

(c) *4 points.* Use the separation of variables technique to show that the *general* solution to the given differential equation has the form $y = \frac{Cx^2}{1 - Cx}$, where C is an unspecified constant.

(d) *3 points.* If possible, find each of the *particular* solutions to the differential equation which go through the points $(1, 1)$, $(1, 0)$ and $(0, 1)$ in the xy-plane, respectively. DISCUSS YOUR ANSWERS.