Math 341 Fall 2010

Quiz **3** DIFFERENTIAL EQUATIONS

Name: _____

Time Begun: _____ **Friday October 8**
Time Ended: _____ Prof. Ron Buckmire

Topic : Systems of Differential Equations

This quiz is designed to illuminate your understanding of the concepts in Chapter 2 of the book: Modeling Using Systems of ODEs, Geometry of Systems of ODEs, Analytic Methods for Special Systems, Euler's Method for Systems.

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 October 11**, 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 **Three**

1. (*2 points.*) What is an equilibrium solution for a 2-dimensional system of differential equations $\frac{d\vec{x}}{dt} = \vec{F}(\vec{x})$ and how does it differ (geometrically) from an equilibrium solution for a differential equation, $\frac{dy}{dt} = f(y)$? (HINT: DRAW PICTURES REPRESENTING THE DIFFERENT SITUATIONS AND USE WORDS TO DESCRIBE THEM.)

2. (*2 points.*) What are the equilibrium solutions for the standard Lotka-Volterra predator-prey model $R' = aR - bRF$, $F' = -cF + dRF$? What is the physical interpretation of these equilibrium values on the predator F and prey R populations?

3. (*2 points.*) Explain in your own words what the difference between coupled and decoupled systems of equations are. Give an example of each type (linear, first-order, ordinary).

4. (*2 points.*) What is a reasonable guess for the general solution of $y' = -3y + t$? [HINT: How many unknown constants should your solution have?]

5. (*2 points.*) **TRUE or FALSE:** "Euler's Method can never be used to approximate solutions to a second-order nonlinear ordinary differential equation." EXPLAIN YOUR ANSWER.