Quiz **6**   Ordinary Differential Equations

Name: _____   **Prof. Ron Buckmire**

                                                            ASSIGNED: Friday October 2

Time Begun: _____
Time Ended: _____   **DUE: Monday October 5**

Topic : Topics from Chapter 1 and Chapter 2

GOAL: This quiz is designed to illuminate your understanding of the concepts in the first few sections of the book: Equilibrium Values, Euler's Method, Linear Differential Equations, Modeling, Classifying Differential Equations, Systems of Differential Equations.

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 October 5**, 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.

1. (*2 points.*) Suppose the amount of money in your bank account after t months is given by $M(t)$ dollars. Right now you have \$200 in your account and a deposit of \$100 is made monthly and the money in the account bears interest at 6% per year. Write down an initial value problem that is a mathematical model whose solution describes the amount of money in your account at any time in the future.

2. (*2 points.*) What is Euler's Method used for? Explain how it is used and what information you need to use it.

3. (*2 points.*) Find the solution of $y' = -y + t,\quad y(0) = 2$. Check your answer.

4. (*2 points.*) Write down an example of an 3rd order, nonlinear, autonomous ODE. Carefully label what features of your ODE correspond to which required properties. Also write your ODE example in the form of a 3-dimensional system of first-order ODEs.

5. (*2 points.*) How does one graphically depict the equilibrium solution for a 2-dimensional system of first order ODEs of the form $\dfrac{d\vec{x}}{dt} = \vec{F}(\vec{x})$ and how does it differ (geometrically or visually) from the graphical depiction of an equilibrium solution for an autonomous ODE of the form $\dfrac{dy}{dt} = f(y)$? (HINT: DRAW PICTURES REPRESENTING THE DIFFERENT SITUATIONS AND USE WORDS TO DESCRIBE THEM.)