Quiz **2**

DUE: WED. SEP. 18

Name: ____________________________

Date: ____________________________
Time Begun: ____________________________
Time Ended: ____________________________

Monday, September 9, 20
Ron Buckm

Topic covered: Euler's Method and a System of ODEs

The idea behind the quiz is for you to illustrate your ability to deal with coupled ordinary differential equations and apply Euler's Method to such a system.

Reality Check:

EXPECTED SCORE : ______________**/10** ACTUAL SCORE : ______________**/10**

Instructions:

1. Once you open the quiz, you have 30 minutes to complete it.
2. You **may not** use the book or any of your class notes, but you may use a calculator. 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.
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules.
5. Relax and enjoy....
6. **This quiz is due on Wednesday, September 18**, at the beginning of class. NO LATE 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.

SHOW ALL YOUR WORK

We will consider the following rate equations and initial conditions on the interval $[0, 1]$.

$$S' = C, \quad C' = -S$$

$$S(0) = 0, \quad C(0) = 1$$

a. *(6 points.)* Use Euler's method with $\Delta t = 0.5$ to estimate the solutions $S(t)$ and $C(t)$ of the above initial value problem. Fill in the following table, which will help you find the approximating functions $\tilde{S}(t)$ and $\tilde{C}(t)$, which approximate the functions $S(t)$ and $C(t)$ which exactly solve the IVP.

t	S	C	S'	C'	ΔS	ΔC
0	0	1				
$\frac{1}{2}$						
1			XXXXXX XXXXXX XXXXXX	XXXXXX XXXXXX XXXXXX	XXXXXX XXXXXX XXXXXX	XXXXXX XXXXXX XXXXXX

Note: You should not need to use a calculator for this problem, but if you must use your calculator, DO NOT round off any decimal points.

b. *(2 points.)* Show that, from the IVP alone, we can tell that the functions $S(t)$ and $C(t)$ obey the expression $S^2 + C^2 = 1$ (HINT: Differentiate this expression with respect to time and use information from the differential equations and the initial condition.)

c. *(2 points.)* Show that $S(t) = \sin(t)$, $C(t) = \cos(t)$ are the exact solutions to the IVP.