BONUS QUIZ

Numerical Analysis

Name: ______________________________

Date: ____________________ **Friday October 29**

Time Begun: ____________________ Ron Buckmire

Time Ended: ____________________

Topic : Appreciating Cubic Convergence

The idea behind this quiz is to give you an appreciation for the significance of quadratic convergence.

Reality Check:

EXPECTED SCORE : __________**/10** ACTUAL SCORE : __________**/10**

Instructions:

1. Once you open the quiz, you have as much time as you need to complete it, but 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.
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 bonus quiz is due on Monday November 1**, in 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.

1. *[4 pts]* The Fixed Slope (Lazy Newton's) Method has an iterative step of $x_{n+1} = g(x_n) = x_n - f(x_n)/f'(x_0)$ where x_0 is the initial guess and $f(x) = 0$ is the equation being solved. Show that this method is a linearly convergent algorithm by computing the value of $|g'(p)|$ where $g(p) = p$ and $f(p) = 0$.

2. *[6 pts]* A cubically-convergent method for computing the solution to $f(x) = x^2 - R = 0$ (i.e. $x = \sqrt{R}$) is the iterative scheme $x_{n+1} = g(x_n) = x_n(x_n^2 + 3R)/(R + 3x_n^2)$. What are the conditions on g' and g'' which must be true at $x = \sqrt{R}$ for this algorithm to be cubically convergent? Show that they are true for this $g(x)$.