Numerical Analysis

Math 370 | MWF 2:30-3:25
Spring 1997 | 127 Fowler

(01.31.97) <u>More on the Bisection and False Position Methods</u>

Bisection Algorithm
The bisection algorithm produces a sequence of approximations $\{p_n\}$ to the zero of the function $f(x)$
where $p_n = a_n + \frac{b_n - a_n}{2} = \frac{a_n + b_n}{2}$ and the n-th bracket is described by $[a_n, b_n]$
Write down an expression for the size of $|b_n - a_n|$ which depends on $b - a$ and the n-th iterate (note: $|b_1 - a_1| = b - a$)

Solve this formula for n.

Try and predict how many iterations it will take Bisection to find the zero of $f(x) = \log(x) - 5 + x$ on the interval [1,9] to 5 decimal places

Go to the computer and see how many iterations `ALG21.TRU` actually takes to converge. Explain.

What are some good features of the bisection algorithm?

What are some drawbacks to the bisection algorithm?

False Position Method (Regula Falsi)

The method of False Position is another ancient method of computing the solution of equations of one variable. It is very similar to the bisection method in that it too is a bracketing method, except that False Position uses the **value** of the function at the end points to help determine where the next bracket occurs. Sketch a picture of this process, below:

False Position visually

False Position iterative step

Example

Use False Position to solve the same equation you previously solved using Bisection and see if there is a difference in the number of steps False Position takes to converge

How did you pick your two initial guesses?

NOTE: Monday Classes Will Be Held In Fowler 201