Numerical Analysis

Math 370 Fall 1998 MWF 11:30am - 12:25pm

Fowler 127

Class 12: **Wednesday September 30**

SUMMARY Analyzing Root Finding Algorithms: Bisection
READING Burden & Faires, 47–54

General Root-Finding Algorithm

1. Plot the function, in order to get an initial guess for the root and to check for problems 2. Select an initial guess [or bracket] 3. Iteratively refine your initial guess 4. Decide you are "converged" 5. Stop

demobisect.m

There is another implementation of Bisection Algorithm in **q:/mfiles/math370/demobise.m**
Modify this m-file to find the root of $f(d) = 2552 - 30d^2 + d^3$
How many steps does it take to converge? Using what initial bracket?

Analyzing Convergence of Bisection

Write down an expression for the size of $|b_n - a_n|$ which depends on $b - a$ and the n-th iterate (note: $|b_0 - a_0| = b - a$)

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 **demobisect.m** actually takes to converge. Explain.

Convergence Criteria

There are a number of different ways to consider that a method has "converged"
There is convergence criteria on $f(x)$ and convergence criteria on x

Question

There is also relative convergence versus absolute convergence. Which do you think is the "best" method of assessessimg convergence?