

CS2262 Spring 2007

Assignment 4: Root Finding

1. Use the bisection method with a hand calculator or computer to find the indicated roots of the following equations. Use an error tolerance of $\epsilon = 0.0001$. (That is, give a table where you show the calculation at each iteration)
 - The real root of $x^3 - x^2 - x - 1 = 0$.
 - The smallest positive root of $\cos(x) = \frac{1}{2} + \sin(x)$.
 - The root of $x = e^{-x}$
2. Write a program in MATLAB to implement the bisection method (look at the example in the text book if you get stuck, but try it on your own first). Use it to check your answers in Problem 1, and then find the roots of the equations to an accuracy of $\epsilon = 10^{-5}$. [Hand in the m-file and the roots].
3. Investigate the behaviour of your code as you increase the accuracy in Problem 2 (that is, as ϵ gets smaller). How does the increased accuracy affect the time needed to obtain the solution? Estimate the length of (wallclock) time that is required to perform one iteration of the bisection method one of the examples in Problem 1.
4. Let the initial interval used in the bisection method have length $b - a = 3$. Find the number of midpoints c_n that must be calculated with the bisection method to obtain an approximate root within an error tolerance of 10^{-9} .
5. Consider the equation $e^{-x} = \sin(x)$. Find an interval $[a, b]$ that contains the smallest positive root. Estimate the number of midpoints c needed to obtain an approximation root that is accurate within an error tolerance of 10^{-10} .

Due February 15th 2007

Email completed assignments to cs2262_assignments@cct.lsu.edu