

MATH 6620
Spring 2019

Homework 1, Due Thursday January 24 2019

Show all the work. Late homework will not be accepted.

Problem 1.

Consider the iterative method to find a root $\alpha \in [a, b]$ of $f(x)$:

$$x_{n+1} = x_n - \frac{b-a}{f(b)-f(a)} f(x_n)$$

Show that the sequence of the iterates x_n converges to the root α (you need to state the conditions on $f(x)$ as well). What is the expected order of the convergence?

Problem 2. (Computational Assignment. Please submit your codes by e-mail and please make tables to illustrate the convergence)

a) Use Newton's method

b) Use Secant method

to calculate the unique root of

$$x + e^{-Ax^2} \cos(x) = 0$$

with $A > 0$ a parameter to be set. Use a variety of increasing values of A , for example, $A=1, 5, 10, 25, 50$. Among the choices of the initial guess x_0 , consider $x_0 = 0$ and explain any anomalous behavior. Discuss the convergence of the methods for different choices of the initial guesses and different values of A . Discuss the difference between Newton's and Secant method in this problem.