CS 357 / MATH 357
Fall 2013

Numerical Methods – Homework 5
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Due: 10/22/2013

Note: Homework is due **5pm** on the due date. Please submit your homework through the dropbox in the Siebel Center basement. Make sure to include your name and **netid** in your homework.

Problem 1 **[2pt]** When would you use Secant method over the Newton method? Please explain your answer under a paragraph.

Problem 2 **[6pt]** Consider the following function.

$$f(x) = x^2 - 3$$

(a) **[4pt]** Calculate four iterations of Secant method using $x_0 = 1$ and $x_1 = 2$. Find x_2, x_3, x_4 and x_5, and the error at each iteration. Show work.

(b) **[2pt]** What is the rate of convergence? How does it compare to the convergence rate of Newton's method and Bisection method?

Problem 3 **[10pt]** Consider the following points.

x	1	2	3
y	2	3	6

(a) **[2pt]** Write the Lagrange basis functions.

(b) **[2pt]** Write the Newton form of the interpolation polynomial using the above points. Leave the coefficients as $a_0, a_1, \ldots$

(c) **[6pt]** Find the 2nd order interpolating polynomial using Newton's polynomial and divided differences. Show work.

Problem 4 **[6pt]** True/False questions

(a) **[2pt] (True/False)** Newton's method always converges faster than the Secant method.

(b) **[2pt] (True/False)** Iterations stay between the two initial points for both Secant and Bisection method.

(c) **[2pt] (True/False)** Adding a new point (x_{n+1}, y_{n+1}) requires less computations for Newton form than Lagrange form.