Homework 2 Problems for cs412

Chapter 4

Problem 1.

Find a polynomial approximation to the function $f(x) = \sin \pi x$ that is accurate to within 10^{-5} for all $x \in [-1,1]$, using $x_0 = 0$. Show the full polynomial approximation and quantify your error bounds.

Problem 2.

Part A. Approximate the derivative of $f(x) = e^x$ at x=1 using forward and centered approximation with single precision floating point numbers (see "help single" in MATLAB for more information). Vary your h from 1/2 to 1/2048 (where h_1=1/2, h_2=1/3, h_3=1/4, etc). Plot your results with the axis 1/h (x-axis) and log error (y-axis). Discuss the rounding and approximation effects illustrated both graphically and analytically.

Part B. Repeat Part A and substitute double precision floating. Compare your results to Part A.

(You must submit singlePrec.m and doublePrec.m via your handin directory.)

Chapter 5

Problem 3.

Part A. Using the incremental search method, find all intervals containing roots for the function $f(x) = -12 - 21x + 18x^2 - 2.75x^3$ using 10 intervals between the bounds of [-1, 6]. Plot the function graphically and report the intervals containing the roots and their error.

Part B. Using the intervals found in Part A, determine the roots of the function using both the bisection and false position methods until the relative error is less than 0.0001. For each run, chart the results as illustrated in Example 5.6 of the text and discuss their rates of convergence. Which method converges the fastest for each interval?

Chapter 6

Problem 4.

6.3 from text. Do all parts except (d). For part (b) and (c), solve without using MATLAB- show your work.

Problem 5.

6.10 from the text.

Problem 6.

6.21 from the text.