Tufts University
Department of Mathematics
Fall 2018

MA 126: Numerical Analysis

Homework 7 (v1.1) [1]

Assigned Friday 26 October 2018
Due Friday 2 November 2018 at 3 pm

1. Atkinson & Han, Section 4.3, Problem 2: While we discussed cubic splines in class, we did not go into great detail, so this will require some reading of the text, particularly Sections 4.3.2 and 4.3.3. The *not-a-knot* boundary conditions are very similar to those used in the equation/unknown count that we did in class.

2. Atkinson & Han, Section 4.3, Problem 16

3. Atkinson & Han, Section 4.5, Problem 7

4. Find the linear minimax approximation to the function

   (a) $f(x) = x^3$ for $x_0 \le x \le x_1$, where $x_0 = 0$ and $x_1 = a$, where $a > 0$ is a fixed given constant.

   (b) $f(x) = x^3$ for $x_0 \le x \le x_1$, where $x_0 = -a$ and $x_1 = a$, where $a > 0$ is a fixed given constant.

5. Using the near-minimax method of Section 4.6, redo Problems (a) 4a and (b) 4b, this time selecting the node locations as the appropriate Chebyshev polynomial zeros. Be sure to simplify your results as much as possible. Compare your results with those of Problem 3. (Hint, first read Atkinson & Han, Section 4.6, Problem 4, and its solution in the back of the book.)

6. Using the linear least-squares approximation method of Section 4.7, redo Problems (a) 4a and (b) 4b. Compare your results with those of Problem 3.

7. Now graph your above results for the choice $a = 1$:

   (a) Plot your straight lines for Problems 4a, 5a and 6a, along with the graph of $y = x^3$ for $x \in [0, a]$.

   (b) Plot your straight lines for Problems 4b, 5b and 6b, along with the graph of $y = x^3$ for $x \in [-a, +a]$.

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