

CS2262 Spring 2007

Assignment 8 (Cubic Splines)

1. Calculate by hand the natural cubic spline interpolating the data

$$\{(1, 1), (2, 1/2), (3, 1/3), (4, 1/4)\}$$

showing all the steps clearly in the calculation (this is an example from the textbook, I want to see that you understand it). Show that the first and second derivatives of the spline function are continuous at the node points

2. Is the following a natural cubic spline on the interval $0 \leq x \leq 2$

$$s(x) = \begin{cases} (x-1)^3 & 0 \leq x \leq 1 \\ 2(x-1)^3 & 1 \leq x \leq 2 \end{cases}$$

3. Use the MATLAB built in function `spline` to interpolate the function

$$f(x) = \frac{1}{1+x^2}, \quad -5 \leq x \leq 5$$

with the following sets of nodes. In each case graph the spline function along with the function $f(x)$ and compare to Figure 4.6 in Atkinson & Han which solves the same function using polynomial interpolation.

- a) $\{-5, -2.5, 0, 2.5, 5\}$
 - b) $\{-5, -3.5, -2, 0, 2, 3.5, 5\}$
 - c) $\{-5, -4.5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 4.5, 5\}$
4. Give the interpolation nodes for the linear minimax approximation for the interval $[-1,1]$. Give the linear near minimax approximation for e^x on $[-1, 1]$.

Due March 27th 2007

Email completed assignments to cs2262_assignments@cct.lsu.edu