

MATH 481A, SPRING 2005

PROJECT 2. THE CUBIC SPLINE INTERPOLATION

Due April 25, 2005

Problem 1: Analysis of performance of the cubic spline.

- Write a code implementing cubic spline $S(x)$ with natural boundary conditions ($S''(a) = S''(b) = 0$). Keep your programming so that you can change the function $y = f(x)$, the interval $[a, b]$, and the number of equally spaced interpolation nodes n , easily. Do the programming so that you can graph $f(x)$, $S(x)$ (one figure), and $f(x) - S(x)$, $f'(x) - S'(x)$ (another figure). (You can use Algorithm 3.4 on page 142)
- For $y = \sin(x)$ on $[0, 10]$ determine experimentally how many interpolation nodes are needed to approximate the function within 10^{-5} .
- Use Theorem 3.13 on page 152 to estimate the number of nodes needed to interpolate $y = \sin(x)$ on $[0, 10]$ within 10^{-5} .
- Write a report. Include results of your experiments (printed pictures or summary of calculations) with minor comments. Include justification for the estimated number of nodes. Attach the code.