

CS416 Spring 2007

Prof. Wright

Assignment #4

Due March 2, 2007

1. Problem 4.1.40 (p.167)
2. The error expression for interpolation with a cubic spline using the not-a-knot condition (as used by Matlab) is as follows:

$$|f(x) - S(x)| \leq \frac{5}{384} h^4 \max_{\zeta \in [a,b]} |f^{(4)}(\zeta)|,$$

for all $x \in [a, b]$, where h is the interval width of the equally spaced knots.

If the function $f(x) = \sin(100x)$ is interpolated using this kind of spline on the interval $[0, \pi]$, find out how many knots are needed to ensure that the error is at most 10^{-8} .

3. Problem 9.2.32 (p. 416)
4. Write a Matlab code (based on one of the examples we discussed in class) to interpolate the function $f(x) = e^{-x^2}$ on the interval $[1, 10]$. Use a cubic spline with the not-a-knot condition and $n = 10$ (that is, 11 knots) equally spaced.

Your code should plot one figure showing the spline (evaluated at 100 equally spaced points in $[1, 10]$) with the knots indicated by circles. It should also plot a second figure showing the error function $e(x) = f(x) - S(x)$, evaluated at 100 equally spaced points in $[1, 10]$).

Hand in hard copies of your codes `hw4-spline.m` and its output together with your written answers. Put your code in a directory called `homework4`. From the parent directory of `homework4`, run the following command:

```
handin -c cs416-1 -a hwk4 -d homework4
```