AMSC/CMSC 460 Quiz 3 , Fall 2002

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, communication with others, scratchpaper, etc.

Name _____

Student number _____

1.(10) Suppose that we have a function f defined on the interval $[0, 2]$, and we want to approximate it by a piecewise linear function that is never further than 10^{-4} from f. If the second derivative of f is bounded by 36, how many equally-spaced points should be use?

2.(10) Recall the basis that we are using for cubic splines with knots $x_1 < x_2 < \ldots < x_n$: We will set $s(x)$ equal to $s_{i+1}(x)$ on interval I_{i+1}, where

$$s_{i+1}(x) = m_i \frac{(x_{i+1} - x)^3}{6h_{i+1}} + m_{i+1} \frac{(x - x_i)^3}{6h_{i+1}} + a_i(x - x_i) + b_i$$

for some constants m_i, m_{i+1}, a_i, and b_i, where

- $h_{i+1} = x_{i+1} - x_i$, $i = 1, \ldots, n-1$
- $k_{i+1} = f_{i+1} - f_i$, $i = 1, \ldots, n-1$
- $I_{i+1} = [x_i, x_{i+1}]$, $i = 1, \ldots, n-1$

Write down the conditions that guarantee that s'' is continuous at the knots $x_2, \ldots x_{n-1}$.