

# Homework 6: CS321-003, Spring 2007

Due Date: 1:50pm, April 25, 2007

Please show all steps in your work. Please be reminded that you should do your homework independently.

1. (10 points) Show that every first-degree spline function that has knots  $t_0, t_1, \dots, t_n$  can be written in the form

$$ax + b + \sum_{i=1}^{n-1} c_i g(x - t_i)$$

2. (10 points) Find a quadratic spline interpolant for these data

|     |   |   |   |   |   |    |
|-----|---|---|---|---|---|----|
| $x$ | 1 | 3 | 4 | 6 | 9 | 11 |
| $y$ | 2 | 0 | 5 | 1 | 8 | 3  |

3. (10 points) Determine if this function is a quadratic spline? Explain why or why not.

$$Q(x) = \begin{cases} 0.1x^2 & 0 \leq x \leq 1 \\ 9.3x^2 - 18.4x + 9.2 & 1 \leq x \leq 1.3 \end{cases}$$

4. (10 points) Determine the parameters  $a, b$  and  $c$  so that  $S$  is a cubic spline

$$S(x) = \begin{cases} x^3 & x \in [0, 1] \\ \frac{1}{2}(x-1)^3 + a(x-1)^2 + b(x-1) + c & x \in [1, 3] \end{cases}$$

5. (10 points) Determine the coefficients so that the function

$$S(x) = \begin{cases} x^3 - 1 & -9 \leq x \leq 0 \\ ax^3 + bx^2 + cx + d & 0 \leq x \leq 5 \end{cases}$$

is a cubic spline and takes the value 2 when  $x = 1$ .