MATH 170B: Discussion 6

May 2018

Divided Differences

1. For the particular function $f(x) = x^m,\ m \in \mathbb{N}$, show that

$$f[x_0, x_1, ..., x_n] = \begin{cases} 1 & , \text{ if } n = m \\ 0 & , \text{ if } n > m \end{cases}$$

Hermite Interpolation

2. **(1)** Use the extended Newton divided difference method to obtain a quartic polynomial that takes these values:

x	1	2	4
p(x)	11	7	27
p'(x)	14	8	

(2) Find a quintic polynomial that takes the values given in the preceding problem and in addition, satisfies $p(5) = 31$.

3. What conditions will have to be placed on nodes x_0 and x_1 if the interpolation problem

$$p(x_i) = c_{i0},\ p''(x_i) = c_{i2},\ (0 \leq i \leq n)$$

is to be solvable by a cubic polynomial (for arbitrary c_{ij}) ?

Spline Interpolation

4. Check if the following function is a Natural Cubic Spline.

$$f(x) = \begin{cases} 2(x+1) + (x+1)^3 & x \in [-1, 0] \\ 3 + 5x + 3x^2 & x \in [0, 1] \\ 11 + 11(x-1) + 3(x-1)^2 - (x-1)^3 & x \in [1, 2] \end{cases}$$