

Homework 5: Interpolation

Due: April 5, 2012

1. Prove that for the interpolating polynomial

$$P(x) = \frac{3hs^2 - 2s^3}{h^3}y_{k+1} + \frac{h^3 - 3hs^2 + 2s^3}{h^3}y_k + \frac{s^2(s-h)}{h^2}d_{k+1} + \frac{s(s-h)^2}{h^2}d_k$$

$$\begin{aligned} P(x_k) &= y_k \\ P(x_{k+1}) &= y_{k+1} \\ P'(x_k) &= d_k \\ P'(x_{k+1}) &= d_{k+1} \end{aligned}$$

Recall, $h = x_{k+1} - x_k$ and $s = x - x_k$.

2. Let p_k be the polynomial of degree $\leq k$ such that $p_k(x_i) = y_i$ for $0 \leq i \leq k$. Prove that $p_k = p_{k-1}$ if and only if $p_{k-1}(x_k) = y_k$.
3. Write the Lagrange and Newton interpolating polynomials for these data:

x	2	0	3
$f(x)$	11	7	28

4. Moler 3.4: Also, test the Lagrange Form with `polyinterp` and piecewise linear interpolation `piecelin`. Which method from `splinetx`, `pchiptx`, `polyinterp`, `piecelin` do you prefer and why?