Mtg 9: Tue, 19 Jan 10

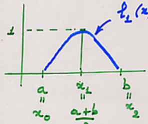
$$\ell_1(x) = \prod_{\substack{j=0 \\ j \neq i = 1}}^{2} \frac{x - x_j}{x_i - x_j} = \frac{(x-x_0)(x-x_2)}{(x_1 - x_0)(x_1 - x_2)}$$

ℓ_i; $x_i - x_j$: $i = 1$; $(x_1 - x_0) > 0$, $(x_1 - x_2) < 0$

$\ell_1 \in \mathcal{P}_2$:= set of poly. of order ≤ 2

ℓ_1: 1 = node number

$\ell_1(x_1) = 1$, $\ell_1(x_0) = \ell_1(x_2) = 0$



$\ell_1''(x_1) < 0$

HW: Use (3) p. 8-3 and (1) p. 8-3 to find expr. for c_0, c_1, c_2 in terms of $(x_i, f(x_i))$, $i = 0, 1, 2$.

HW: Use (4) p. 8-3 to derive the simple Simpson's rule (2) p. 7-2.

(1)-(2) p. 7-3: Gen. Newton-Cotes w/ (n+1) pts $x_0, x_1, \dots, x_n$

$f_n(x) = p_n(x) \in \mathcal{P}_n$ = set of poly. of order $\leq n$.

$l_{i,n}(x) \in \mathcal{P}_n$

(i = node number, n = order)

HW: $f(x) = \dfrac{e^x - 1}{x}$ on $[0,1]$

$x_0 = a = 0$, $x_n = b = 1$

Consider $n = 1, 2, 4, 8, 16$ (1 = Trap., 2 = Simpson)

Constr. $f_n(x) = \sum_{i=0}^{n} l_{i,n}(x) f(x_i)$

plot f, f_n, $n = 1, 2, 4, 8, 16$

Comp. $I_n = \int_a^b f_n(x)\,dx$, $n = 1, 2, 4, 8$

and compare to I.

For $n = 4$, plot l_0, l_1, l_2.
why not l_3, l_4 also?

HW: Show (1) p.7-1 ⇒ (2) p.7-1

(1) p.7-1: Simple Trap. ⇒ (2) p.7-1: Compos. Trap. rule

(2) p.7-2 ⇒ (3) p.7-2

(2) p.7-2: Simple Simpson ⇒ (3) p.7-2: Compos. Simpson