

Øving 2 - Matematikk 4N

Oppgave 1

x_i	-2	-1	1	2
$f(x_i)$	-3	$3/4$	$-3/2$	$3/2$

Lagrange: a) $l_0(x) = \frac{(x+1)(x-1)(x-2)}{(-1) \cdot (-3) \cdot (-4)} = -\frac{1}{12}(x^3 - 2x^2 - x + 2)$

$$l_1(x) = \frac{(x+2)(x-1)(x-2)}{1 \cdot (-2) \cdot (-3)} = \frac{1}{6}(x^3 - x^2 - 4x + 4)$$

$$l_2(x) = \frac{(x+2)(x+1)(x-2)}{3 \cdot 2 \cdot (-1)} = -\frac{1}{6}(x^3 + x^2 - 4x - 4)$$

$$l_3(x) = \frac{(x+2)(x+1)(x-1)}{4 \cdot 3 \cdot 1} = \frac{1}{12}(x^3 + 2x^2 - x - 2)$$

$$\Rightarrow p_3(x) = -3 \cdot l_0(x) + \frac{3}{4} \cdot l_1(x) - \frac{3}{2} l_2(x) + \frac{3}{2} l_3(x)$$

$$= \frac{1}{4}(x^3 - 2x^2 - x + 2) + \frac{1}{8}(x^3 - x^2 - 4x + 4) + \frac{1}{4}(x^3 + x^2 - 4x - 4) + \frac{1}{8}(x^3 + 2x^2 - x - 2)$$

$$\underline{\underline{p_3(x) = \frac{3}{4}x^3 - \frac{1}{8}x^2 - \frac{15}{8}x - \frac{1}{4}}}$$

Newton:

$n=3$

$$w_0 = 1$$

$$w_1 = x+2$$

$$w_2 = (x+2)(x+1) = x^2 + 3x + 2$$

$$w_3 = (x+2)(x+1)(x-1) = x^3 + 2x^2 - x - 2$$

-2	-3			
-1	$3/4$	$15/4$	$-13/8$	
1	$-3/2$	$-9/8$	$11/8$	$3/4$
2	$3/2$	3		

$$p_3(x) = -3 \cdot 1 + \frac{15}{4}(x+2) - \frac{13}{8}(x^2 + 3x + 2) + \frac{3}{4}(x^3 + 2x^2 - x - 2)$$

$$\underline{\underline{p_3(x) = \frac{3}{4}x^3 - \frac{1}{8}x^2 - \frac{15}{8}x - \frac{1}{4}}}$$

De to polynomene er like. $f(0) \approx -\frac{1}{4}$ ($= p_3(0)$)