Numerische Mathematik Hausaufgaben

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Aufgabe 1

Aufgabe 2

a)

i	0	1	2	3
t_i	0	1	3	4
f_i	4	5	7	-4

a) $p(2)$ $t = 2$

$P_{0,0} := 4$

$P_{1,0} := 5$
$P_{1,1} = 5 + \frac{2-1}{1-0}(5-4) = 6$

$P_{2,0} = 7$
$P_{2,1} = 7 + \frac{2-3}{3-1}(7-5) = 6$
$P_{2,2} = 6 + \frac{2-3}{3-0}(6-6) = 6$

$P_{3,0} = -4$
$P_{3,1} = -4 + \frac{2-4}{4-3}(-4-7) = 18$
$P_{3,2} = 18 + \frac{2-4}{4-1}(18-6) = 10$
$P_{3,3} = 10 + \frac{2-4}{4-0}(-6-6) = 8$

$\curvearrowright p(2) = 8$

b)
$t := (0, 1, 3, 4)$

$L_0(0) = -\frac{1}{12}(t-1)(t-3)(t-4)$

$L_1(1) = \frac{1}{6}(3-t)(4-t)t$

$L_2(3) = \frac{1}{6}(4-t)(t-1)t$

$L_3(4) = \frac{1}{12}t(t-1)(t-3)$

p(t)=$(\frac{t-1}{0-1} * \frac{t-3}{0-3} * \frac{t-4}{0-4}) * 4 + (\frac{t-0}{1-0} * \frac{t-3}{1-3} * \frac{t-4}{1-4}) * 5(\frac{t-0}{3-0} * \frac{t-1}{3-1} * \frac{t-4}{3-4}) * 7 + (\frac{t-0}{4-0} * \frac{t-1}{4-1} * \frac{t-3}{4-3}) * -4$

$p(t) = -t^3 + 4t^2 - 2t + 4$

c)

i	t_i	f_i			
0	0	4			
1	1	5	$\frac{5-4}{1-0} = 1$		
2	3	7	$\frac{7-5}{3-1} = 1$	$\frac{1-1}{2-0} = 0$	
3	4	-4	$\frac{-4-7}{4-3} = -11$	$\frac{-11-1}{4-1} = -4$	$\frac{-4-0}{4-0} = -1$

$N_0 = 1$
$N_1 = t$
$N_2 = (t-0) \cdot (t-1) = t(t-1)$
$N_3 = (t-0) \cdot (t-1) \cdot (t-3) = t(t-1)(t-3)$

$p = 4 * 1 + 1 * t - 0 + (t(t-1)(t-3) * (-1)) = -t^3 + 4t^2 - 2t + 4$

Aufgabe 3

a)

b) siehe ZehnPunktDrei.py