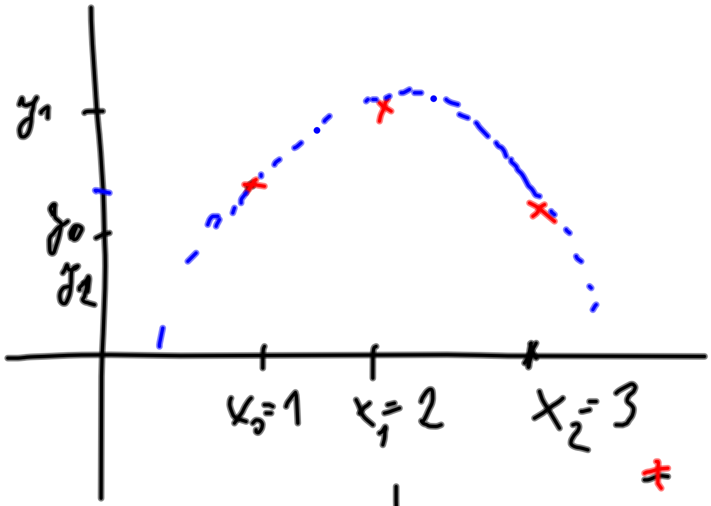
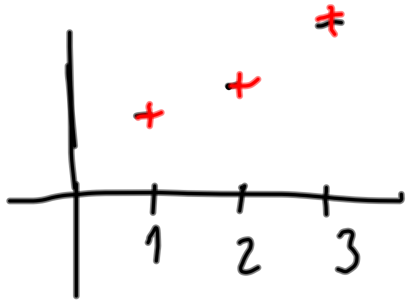
$g(x) = dx^3 + ex^2 + hx + j \qquad f(x) = ax^2 + bx + c$

$$ax_0^2 + bx_0 + c = y_0$$





$L(x) = ax^2 + bx + c$

$L(1) = 2: \quad a + b + c = 2 \Rightarrow c = 2 - a - b$

$L(2) = 3: \quad 4a + 2b + c = 3$

$L(3) = 5: \quad 9a + 3b + c = 5$

$\Rightarrow 3a + b = 1 \Rightarrow b = 1 - 3a$

$8a + 2b = 3$

$8a + 2(1 - 3a) = 3 \Rightarrow 2a = 1 \Rightarrow a = \frac{1}{2} \Rightarrow b = -\frac{1}{2}$

$\Rightarrow c = 2$

$\% = \frac{1}{2}x^2 - \frac{1}{2}x + 2$

$L(x) = \frac{1}{2}x^2 - \frac{1}{2}x + 2$

$$L(x) = 2 \cdot \frac{(x-2)(x-3)}{(1-2)(1-3)} + 3\frac{(x-1)(x-3)}{(2-1)(2-3)} + 5\frac{(x-1)(x-2)}{(3-1)(3-2)} =$$

$$= x^2 - 5x + 6 - 3(x^2 - 4x + 3) + \frac{5}{2}(x^2 - 3x + 2) = \%$$

$$L(x) = \frac{(x-1)(x-1-i)}{(i-1)(i-1-i)} + i\,\frac{(x-i)(x-1-i)}{(1-i)(1-1-i)} +$$

$$+ 2\cdot \frac{(x-1)(x-i)}{(1+i-1)(1+i-i)}$$

$$= \frac{x^2-2x+1-ix+i}{(1-i)} - 1\cdot\frac{x^2-2ix-1-x+i}{(1-i)} - 2i\left(x^2-x(1+i)+i\right)$$

$$= \frac{1}{2}(1+i)\left(x^2-x(i+2)+i+1\right) - \frac{1}{2}(1+i)\left(x^2-x(1+2i)+i-1\right) -$$

$$-2i\left(x^2-x(1+i)+i\right) =$$

$$= -2ix^2 + x\Big(-\tfrac{1}{2}(1+i)(i+2) + \tfrac{1}{2}(1+i)(1+2i) +$$

$$+ 2i(1+i)\Big) +$$

$$+ \tfrac{1}{2}(1+i)(1+i) - \tfrac{1}{2}(1+i)(i-1) + 2 =$$

$$= -2i^2 + x\left(-\tfrac{1}{2}(1+3i) + \tfrac{1}{2}(-1+3i) + 2i - 2\right) +$$

$$+ i + 1 + 2 =$$

$$= -2ix^2 + x(-3+2i) + i + 3$$

$$L(1) = i$$

$$L(i) = 2i + i(-3+2i) + i + 3 = 2i - 3i - 2 + i + 3 = 1$$

$$L(1+i) = -2i(1+i)^2 + (1+i)(2i-3) + i + 3 =$$

$$= -2i \cdot 2i + (-5-i) + i + 3 =$$

$$= 4 - 5 - i + i + 3 = 2$$

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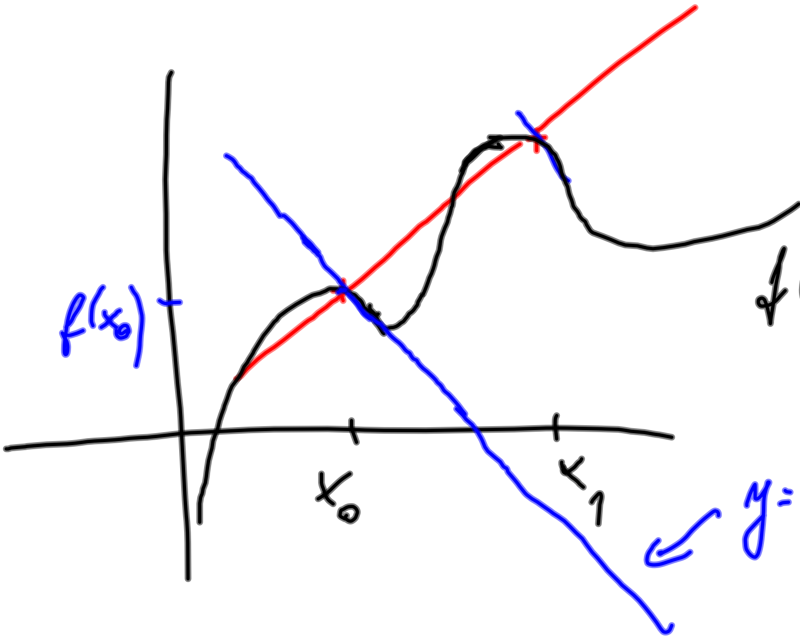
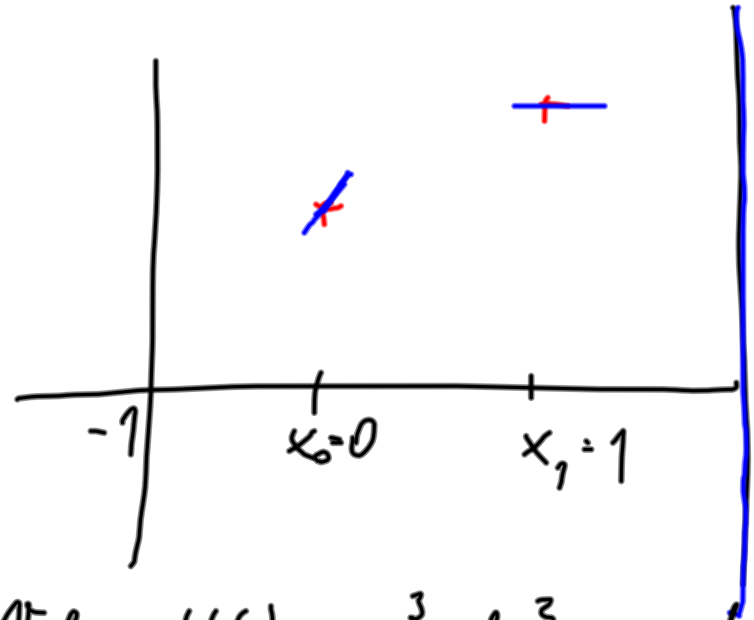


$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

$$y = f'(x_0)(x - x_0) + f(x_0)$$

$$f'(x) = n \cdot a_n x^{n-1} + (n-1) a_{n-1} x^{n-2} + \dots + a_1$$



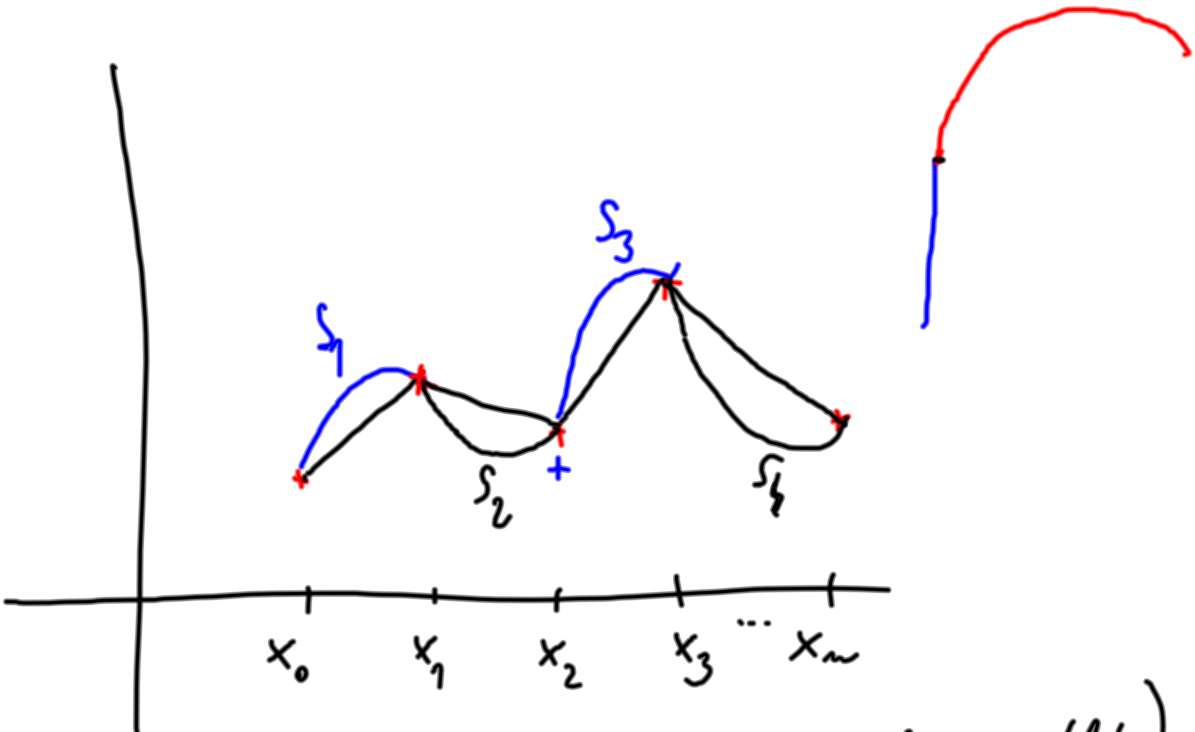
Volme $H(x) = ax^3 + bx^2 + cx + d$, $H'(x) = 3ax^2 + 2bx + c$

$H(0) = 2 \Rightarrow d = 2$ $\qquad$ $H(1) = 3 : a + b + 3 = 3 \Rightarrow a = -b$

$H'(0) = 1 \Rightarrow c = 1$ $\qquad$ $H'(1) = 0 : 3a + 2b + 1 = 0$

$3a - 2a + 1 = 0 \Rightarrow a = -1 \Rightarrow b = 1$

$H(x) = -x^3 + x^2 + x + 2$



Hledáme fce S_1, S_2, S_3, S_4 (polynomiální)
tak aby $S_1(x_0)=y_0$, $S_1(x_1)=y_1$, $S_2(x_1)=y_1$
$S_1'(x_1)=S_2'(x_1)$, $S_1''(x_1)=S_2''(x_2)$

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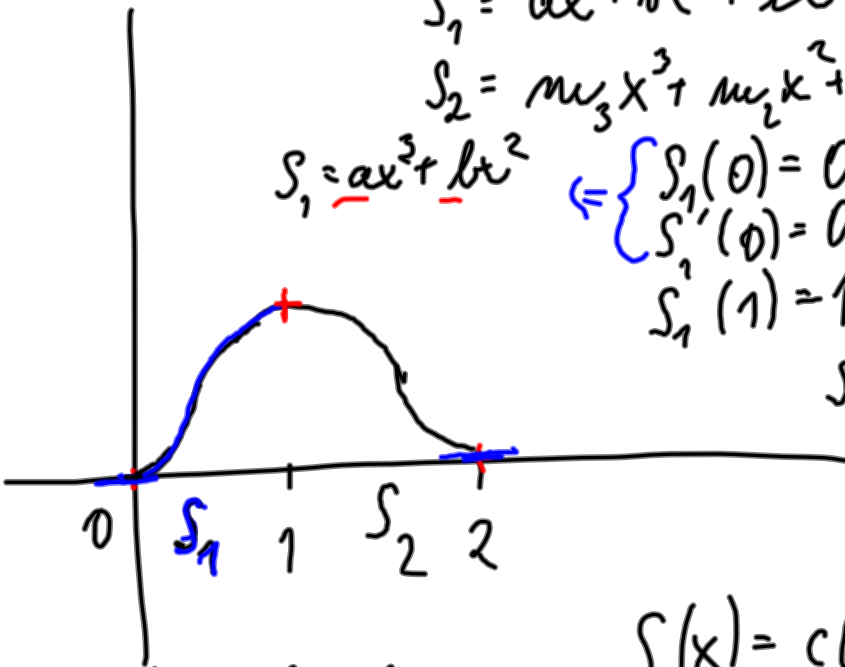
$$S_1 = ax^3 + bx^2 + cx + f$$
$$S_2 = m_3x^3 + m_2x^2 + m_1x + m_0$$

$$S_1 = ax^3 + bx^2$$

$$\Leftarrow \begin{cases} S_1(0) = 0 \\ S_1'(0) = 0 \end{cases}$$
$$S_1(1) = 1$$

$$S_2(1) = 1$$
$$\left.\begin{matrix} S_2(2) = 0 \\ S_2'(2) = 0 \end{matrix}\right\}$$

$$S_1'(1) = S_2'(1)$$
$$S_1''(1) = S_2''(1)$$



$$S_1(1) = a + b = 1$$
$$S_2(1) = -c + d = 1$$

$$S_2(x) = c(x-2)^3 + d(x-2)^2$$
$$S_1'(x) = 3ax^2 + 2bx$$
$$S_1''(x) = 6ax + 2b$$

$$S_2'(x) = 3c(x-2)^2 + 2d(x-2)$$
$$S_2''(x) = 6c(x-2) + 2d$$

$b = 1-a$
$d = 1+c$

$S_1'(1) = S_2'(1)$: $3a + 2b = 3c - 2d$

$S_2''(1) = S_2''(1)$: $6a + 2b = -6c + 2d$

Ü

$$3a + 2(1-a) = 3c - 2(1+c)$$
$$6a + 2(1-a) = -6c + 2(1+c)$$

$a - c + 4 = 0 \Rightarrow 2a + 4 = 0 \Rightarrow a = -2$

$4a + 4c = 0 \Rightarrow a = -c \Rightarrow c = +2$

$\Rightarrow b = 3, \; d = 3$

$$S_1(x) = -2x^3 + 3x^2$$
$$S_2(x) = 2(x-2)^3 + 3(x-2)^2 = 2x^3 - 9x^2 + 12x - 4$$

ÜB: $S_1(1) = 1 = S_2(1)$

$S_1'(x) = -6x^2 + 6x$ $\qquad$ $S_2'(x) = 6x^2 - 18x + 12$

$S_1''(x) = -12x + 6$ $\qquad$ $S_2''(x) = 12x - 18$

$S_1'(1) = S_2'(1) = 0$

$S_1''(1) = S_2''(1) = -6$

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