

1. Datenpunkte:
$$\begin{array}{c|cccc} & 0 & 1 & 2 & 3 \\ \hline x & 4 & 6 & 8 & 10 \\ \hline y & 6 & 3 & 5 & 0 \end{array}$$

• 4 Stützpunkte $\rightarrow n=3 \rightarrow i=0, \dots, n-1$

1) a_i -Werte:

• $a_0 = y_0 = 6$

• $a_1 = y_1 = 3$

• $a_2 = y_2 = 5$

2) h_i -Werte:

• $h_0 = x_{0+1} - x_0 = 6 - 4 = 2$

• $h_1 = x_{1+1} - x_1 = 8 - 6 = 2$

• $h_2 = x_{2+1} - x_2 = 10 - 8 = 2$

3) c_i -Werte:

$c_0 = 0, c_3 = 0$

Gleichungssystem: (Spezial, da $n \neq 4 \rightarrow$ Nur 2 c -Werte berechnen)

• $2(h_0 + h_1)c_1 + h_1 c_2 = 3 \frac{y_2 - y_1}{h_1} - 3 \frac{y_1 - y_0}{h_0} \rightarrow 8c_1 + 2c_2 = 3 \frac{6}{2} - 3 \frac{3}{2} = 13,5$

• $h_1 c_1 + 2(h_1 + h_2)c_2 = 3 \frac{y_3 - y_2}{h_2} - 3 \frac{y_2 - y_1}{h_1} \rightarrow 2c_1 + 8c_2 = 3 \frac{0}{2} - 3 \frac{6}{2} = -22,5$

Matrixform:

$$\begin{pmatrix} 8 & 2 \\ 2 & 8 \end{pmatrix} \cdot \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} = \begin{pmatrix} 13,5 \\ -22,5 \end{pmatrix}$$

$\Rightarrow c_1 = 2,55, c_2 = -3,45$

4) b_i -Werte:

• $b_0 = \frac{y_1 - y_0}{h_0} - \frac{h_0}{3}(c_1 + 2c_0) = -3,2$

• $b_1 = \frac{y_2 - y_1}{h_1} - \frac{h_1}{3}(c_2 + 2c_1) = 1,9$

• $b_2 = \frac{y_3 - y_2}{h_2} - \frac{h_2}{3}(c_3 + 2c_2) = 0,1$

b) d_i - Werte:

$$\cdot d_0 = \frac{1}{3h_0} (c_1 - c_0) = 0.425$$

$$\cdot d_1 = \frac{1}{3h_1} (c_2 - c_1) = -1$$

$$\cdot d_2 = \frac{1}{3h_2} (c_3 - c_2) = 0.575$$



$$S_0 = 6 - 3.2(x-4) + 0.425(x-4)^3$$

$$S_1 = 3 - 1.9(x-6) + 2.55(x-6)^2 - 1(x-6)^3$$

$$S_2 = 9 + 0.1(x-8) - 3.45(x-8)^2 + 0.575(x-8)^3$$