Die Koeffizienten von

$$\hat{K}^{(i)} = \begin{bmatrix} K_{11}^{(i)} & K_{12}^{(i)} & K_{13}^{(i)} \\ K_{21}^{(i)} & K_{22}^{(i)} & K_{23}^{(i)} \\ K_{31}^{(i)} & K_{32}^{(i)} & K_{33}^{(i)} \end{bmatrix} \quad \text{und} \quad \hat{\underline{f}}^{(i)} = \begin{bmatrix} f_1^{(i)} \\ f_2^{(i)} \\ f_3^{(i)} \end{bmatrix}$$

werden mittels Abbildung auf das Basiselement

$$\bar{\delta}_i = [x_{i-1}, x_i] \; \underset{x = x_{\delta_i}(\xi) :=}{\overset{\xi = \xi_{\delta_i}(x) := ..}{\rightleftarrows}} \; \bar{\Delta} = [0,1]$$

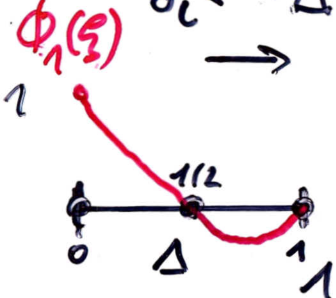
berechnet, d.h. für unser Bsp. (vgl. (K), $\lambda = 1$)

$$\int_a^b \lambda(x)\, u_h'(x)\, v_h'(x)\, dx = \sum_{i=1}^n \int_{x_{i-1}}^{x_i} \lambda(x)\, u_h'(x)\, v_h'(x)\, dx = \ldots$$

folgt z.B. für

$$K_{11}^{(i)} = \int_{x_{i-1}}^{x_i} \lambda(x)\, \frac{d\varphi_{2i-2}}{dx}(x) \cdot \frac{d\varphi_{2i-2}}{dx}\, dx$$

$$= \int_0^1 \lambda(x_{\delta_i}(\xi))\, \frac{1}{h}\frac{d\phi_1}{d\xi}(\xi) \cdot \frac{1}{h}\frac{d\phi_1}{d\xi}(\xi)\, h\, d\xi$$



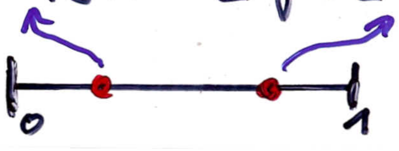
$\delta_i \leftarrow \Delta$: $x = x_{\delta_i}(\xi) = (x_i - x_{i-1})\xi + x_{i-1} = h\xi + x_{i-1}$

$\longrightarrow$ $\xi = \xi_{\delta_i}(x) = \dfrac{x - x_{i-1}}{x_i - x_{i-1}} = \dfrac{1}{h}(x - x_{i-1})$

$dx = h\, d\xi$, $\dfrac{d}{dx} = \dfrac{d}{d\xi}\dfrac{d\xi}{dx} = \dfrac{1}{h}\dfrac{d}{d\xi}$

$$= \frac{1}{h} \underbrace{\int_0^1 \lambda(x_{\delta_i}(\xi))\, \frac{d\phi_1}{d\xi}(\xi)\, \frac{d\phi_1}{d\xi}(\xi)\, d\xi}_{=:\, g(\xi)}$$

$$\approx \frac{1}{h}\left[\frac{1}{2} g\left(\frac{1}{2}\left(1 - \frac{1}{\sqrt{3}}\right)\right) + \frac{1}{2} g\left(\frac{1}{2}\left(1 + \frac{1}{\sqrt{3}}\right)\right)\right]$$

GAUSS 2 : 

$= \Delta$