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. (7)) $\lambda(x) = 1$

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

folgt z.B. für

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

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

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

$$\xi = \frac{x - x_{i-1}}{h}$$

$$dx = h\, d\xi \qquad \frac{d}{dx} = \frac{d}{d\xi} \frac{d\xi}{dx} = \frac{1}{h} \frac{d}{d\xi}$$

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

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

GAUSS 2 :