Zur Berechnung von $\underline{f}^{(r)}$ und $K^{(r)}$, $r=\overline{1,R_h}$ für Modellproblem (23) = VF von (22):

(23) Ges. $u \in V_g := \{ v \in V := H^1(\Omega) : v = g_1 \text{ auf } \Gamma_1 \}$:

$$\underbrace{\int_\Omega \Big[\lambda_1 \frac{\partial u}{\partial x_1}\frac{\partial v}{\partial x_1} + \lambda_2 \frac{\partial u}{\partial x_2}\frac{\partial v}{\partial x_2} + auv\Big]dx}_{2.} + \underbrace{\int_{\Gamma_3} \alpha u v\, ds}_{\text{RB } 3.} = \underbrace{\int_\Omega f\cdot v\, dx}_{1.} + \underbrace{\int_{\Gamma_2} g_2 v\, ds}_{\text{RB } 3.} + \underbrace{\int_{\Gamma_3} \alpha g_3 v\, ds}_{\text{RB } 3.}$$

$$a(u,v) = \langle F, v\rangle \quad \forall v \in V_0$$

1. Elementlastvektoren $\underline{f}^{(r)} = [f_\alpha^{(r)}]_{\alpha \in A_r = A = \{1,2,3\}}$:

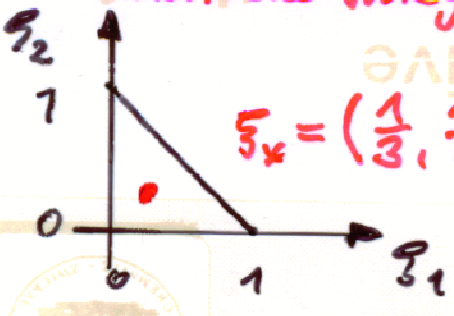
$$f_\alpha^{(r)} = \int_{\delta_r} f(x)\, \varphi_\alpha^{(r)}(x)\, dx$$

$$= \int_\Delta f(x_{\delta_r}(\xi))\, \Phi_\alpha(\xi)\, \underbrace{|J_r|}_{=|\det J_r|}\, d\xi$$

$\delta_r \to \Delta$

$$\approx f(x_{\delta_r}(\xi_*))\, \Phi_\alpha(\xi_*)\, |J_{\delta_r}|\, \underbrace{\operatorname{meas}\Delta}_{=:1/2}$$

numerische Integration: Lehrbuch Abs. 4.5.5
S. 232–238



$\xi_* = \left(\frac{1}{3}, \frac{1}{3}\right)$

$$\boxed{f_\alpha^{(r)} := f(x_{\delta_r}(\xi_*))\, \Phi_\alpha(\xi_*)\, |J_r| \cdot \frac{1}{2}}$$