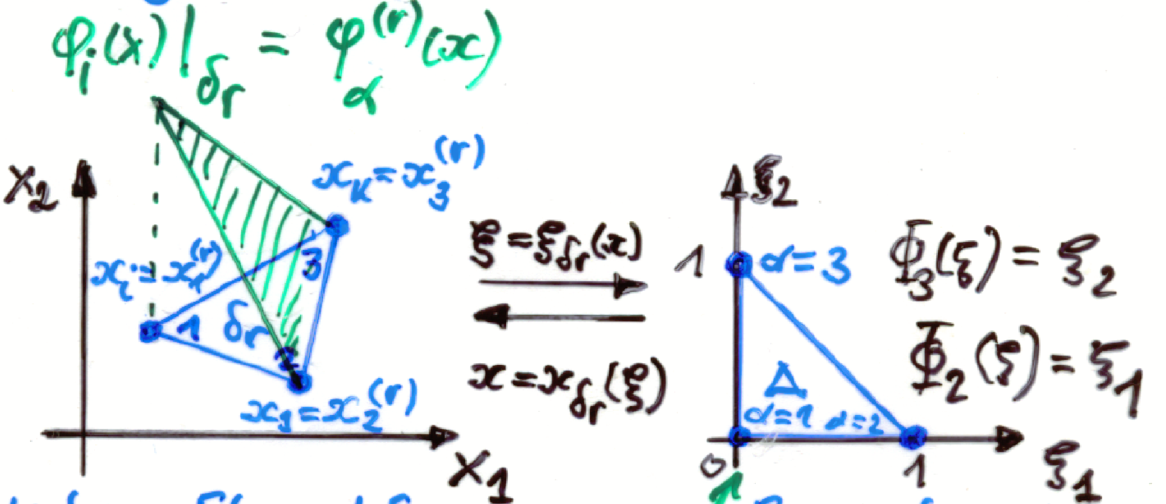
FEM-Technologie zum elementeweisen Aufbau von K_h und $\underline{f}_h$: (vgl. Pkt. 2.5: 1D)

- **Abbildungsprinzip:** $\delta_r \longleftrightarrow \Delta$



beliebiges Element $\delta_r \in \mathcal{T}_h$

$i = i(r,1),\ j = j(r,2),\ k = k(r,3)$

Basiselement Δ

$\Phi_1(\xi) = 1 - \xi_1 - \xi_2$

$$x = x_{\delta_r}(\xi) := J_r \xi + x_i:$$

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} x_{1,j} - x_{1,i} & x_{1,k} - x_{1,i} \\ x_{2,j} - x_{2,i} & x_{2,k} - x_{2,i} \end{pmatrix} \begin{pmatrix} \xi_1 \\ \xi_2 \end{pmatrix} + \begin{pmatrix} x_{1,i} \\ x_{2,i} \end{pmatrix}$$

$$\xi = \xi_{\delta_r}(x) := J_r^{-1}(x - x_i):$$

$$\begin{pmatrix} \xi_1 \\ \xi_2 \end{pmatrix} = \frac{1}{\det J_r} \begin{pmatrix} x_{2,k} - x_{2,i} & -(x_{1,k} - x_{1,i}) \\ -(x_{2,j} - x_{2,i}) & x_{1,j} - x_{1,i} \end{pmatrix} \begin{pmatrix} x_1 - x_{1,i} \\ x_2 - x_{2,i} \end{pmatrix}$$

2. $|\det J_r| = 2 \operatorname{meas} \delta_r, \quad \operatorname{meas} \delta_r = \int_{\delta_r} dx = \ldots$

$$\varphi_i(x) = \begin{cases} \varphi_i(x)|_{\delta_r} = \varphi_\alpha^{(r)}(x), & x \in \overline{\delta_r},\ r \in B_i \text{ (Formfkt)} \\ 0, & \text{sonst, d.h. } x \in \overline{\Omega} \setminus \bigcup_{r \in B_i} \overline{\delta_r} \end{cases}$$

$$B_i := \{ r \in R_h : x_i \in \overline{\delta_r} \}$$

$$\varphi_\alpha^{(r)}(x) = \Phi_\alpha(\xi_{\delta_r}(x))$$