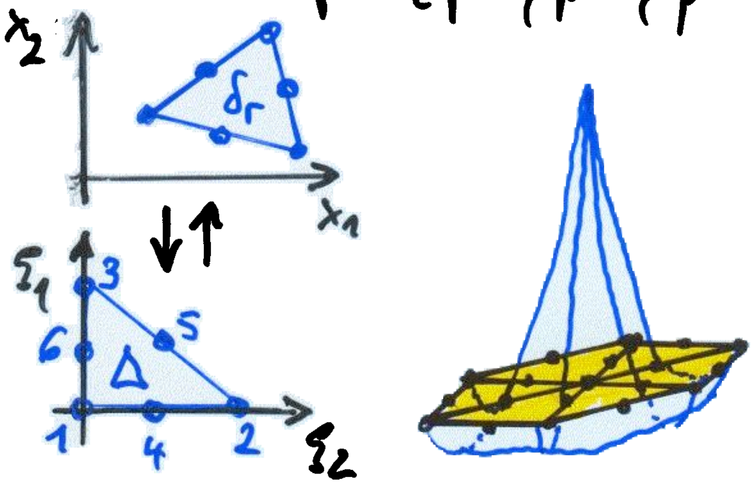
Remark 2.1: Generalization to (Courant!)

1. Higher order basis (ansatz/test) functions on triangular elements:

(a) quadratic elements:

$$\mathcal{F}(\Delta) = \mathcal{P}_2 = \{a_0 + a_1\xi_1 + a_2\xi_2 + a_3\xi_1^2 + a_4\xi_1\xi_2 + a_5\xi_2^2\}$$
$$= \mathrm{span}\{p^{(1)}, p^{(2)}, p^{(3)}, p^{(4)}, p^{(5)}, p^{(6)}\}$$



nodal basis

$p^{(1)}(\xi) =$?

$p^{(2)}(\xi) =$?

....

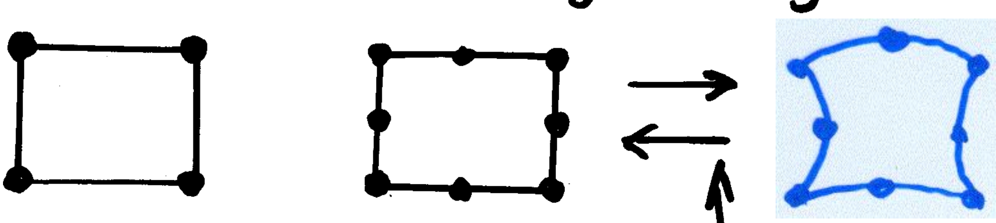
$p^{(\alpha)}(\xi^{(\beta)}) = \delta_{\alpha,\beta}$

(b) cubic elements: $\mathcal{F}(\Delta) = \mathcal{P}_3 = \mathrm{span}\{p^{(i)}\}_{i=\overline{1,10}}$

(c) general: Lagrangian elements of degree p

$\mathcal{F}(\Delta) = \mathcal{P}_p \implies \boxed{C^0\text{-elements}}$

2. Other 2D C^0-elements: e.g. rectangular elements



bilinear element $\mathcal{F}(\Delta) = Q_1$

SERENDIPITY element of 2nd order $\mathcal{F}(\Delta) \subset Q_2$

generalizations $\downarrow$ $\mathcal{P}_p \subset \mathcal{F}(\Delta) \subset Q_p$

isoparametric 2nd order SERENDIPITY element

$x = x_{\delta_r}(\xi) = \sum_{\alpha \in A} x^{(\alpha)} p^{(\alpha)}(\xi)$