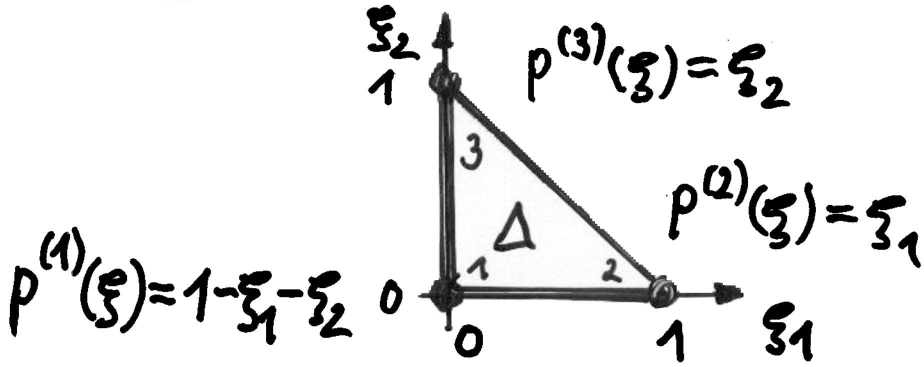
E 2.5 Show that a regular family of triangular meshes in the sense of definition (4) is also a regular triangulation in the sense of Definition 2.3! Provide the constants $\underline{c}_1$, $\overline{c}_1$, c_2 and c_3!

E 2.6 Compute $\lambda_{min}(G_0) = ?$ and $\lambda_{max}(G_1) = ?$ for Courant's element



and $\underline{\gamma} = ?$ and $\overline{\gamma} = ?$ for our model problem (2) on a regular triangular mesh!
<u>Hint:</u> Use the results of E 2.5!

E 2.7 Show that the Eigenvalue estimates (11) are sharp with respect to the h-order, i.e.
$\exists\, \underline{c}_E', \overline{c}_E' = const > 0 : \underline{c}_E', \overline{c}_E' \neq c(h)$ and
$\lambda_{min}(K_h) \leq \underline{c}_E' h^d$ and $\lambda_{max}(K_h) \geq \overline{c}_E' h^{d-2}$!
Therefore: $\lambda_{min} = O(h^d)$, $\lambda_{max} = O(h^{d-2})$, $\varkappa(K_h) = O(h^{-2})$.

E 2.8 Show the spectral equivalence inequalities

$$\underline{c}_M h^d (\underline{u}_h, \underline{u}_h) \leq (M_h \underline{u}_h, \underline{u}_h) = \| u_h \|^2_{L_2(\Omega)} \leq \overline{c}_M h^d (\underline{u}_h, \underline{u}_h)$$

$$\forall\, \underline{u}_h = [u^{(i)}]_{i \in \omega_h} \longleftrightarrow u_h = \sum_{i \in \omega_h} u^{(i)} p^{(i)} \in V_{0h},$$

with the mass matrix $M_h = [\int_\Omega p^{(j)} p^{(i)} dx]_{i,j \in \omega_h}$.