- not mentioned in lectures, there is an additional level of complexity introduced by functions that span degenerate irreducible representations
  - the first thing to note is that the components of a degenerate IR are orthogonal
  - for example consider p_x and p_y as basis functions of IR E $\int p_x p_y d\tau = 0$
  - and since IR are orthogonal to each other, the components of a degenerate representation are orthogonal to all the other IR
  - for example if $f_i^\Gamma = f_1^E = p_x$ and $f_j^\Gamma = f_2^E = p_y$ and $f_k^\Gamma = f_1^A = p_z$ then

$$\int f_1^E f_2^E d\tau \propto \delta_{EE}\delta_{12} = 0$$

$$\int f_1^E f_1^A d\tau \propto \delta_{EA}\delta_{11} = 0$$

$$\int f_1^E f_1^E d\tau \propto \delta_{EE}\delta_{11} \neq 0$$

$$I = \int f_i^\Gamma f_j^{\Gamma'} d\tau \propto \delta_{\Gamma\Gamma'}\delta_{ij}$$

an integral $I = \int f_i^\Gamma f_j^{\Gamma'} d\tau$ over a symmetric range is necessarily zero unless the product $f_i^\Gamma f_j^{\Gamma'}$ is a basis for the totally symmetric irreducible representation, and this only occurs if $f_i^\Gamma = f_j^{\Gamma'}$