Spintronics in Nanostructures SS 2007
Assignment 2 Handing in on Monday 09.04.07

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Exercise 1*. Point Group T_d.

Consider the full point group of a tetrahedron (T_d).
a) Find all elements of the group and determine the order of the group.
b) Determine the order of the elements of T_d.
c) Find the classes of T_d.

Exercise 2*. Great Orthogonality theorem.

Consider irreducible representations of the point group C_{3v} ($\rho : C_{3v} \to D_\nu \subset GL_2(\mathbb{R})$).
Using matrix representation of C_{3v}, calculate:

$$\sum_{g_i \in C_{3v}} D(g_i)^*_{11} D(g_i)_{11}, \quad \sum_{g_i \in C_{3v}} D(g_i)^*_{22} D(g_i)_{22},$$
$$\sum_{g_i \in C_{3v}} D(g_i)^*_{12} D(g_i)_{12}, \quad \sum_{g_i \in C_{3v}} D(g_i)^*_{11} D(g_i)_{22}.$$

Using the great orthogonality theorem, find the result for the previous relations. Compare the results.

Exercise 3. Characters I

Proof the following theorem:
Theorem 1. *The character for each element in a class is the same.*

Exercise 4. Characters II

Proof the following theorem:
Theorem 2. *The number of irreducible representations is equal to the number of classes.*