Applications of Group Theory

PD Dr. Andrea Donarini
Lectures 9.2.01, Mondays, 14:15
Exercises H34, Wednesdays, 14:00

Sheet 11

1. Character tables of double groups

1. Construct the character table of the group $\bar{D}_2$

2. Consider the group D_4 and find the classes of the associated double group $\bar{D}_4$ (Hint: make use of the Opechowski's rules)

3. Which is the number of irreducible spinor representations in $\bar{D}_2$, and in $\bar{D}_4$?

4. Complete now the character table of the double group $\bar{D}_4$.

2. Geometry of rotations

1. Prove that all the C_3 operations of the octahedral group O (group of the cube) are conjugate, but that this is not so for the T group (group of the tetrahedron). Discuss the corresponding classes in these groups. Hint: make use of the concept of pole.

2. Prove that
$$R(\lambda; \boldsymbol{\Lambda})\mathbf{r} = (1 - 2\Lambda^2)\mathbf{r} + 2\lambda(\boldsymbol{\Lambda} \times \mathbf{r}) + 2(\boldsymbol{\Lambda} \cdot \mathbf{r})\boldsymbol{\Lambda}$$

where $R(\lambda; \boldsymbol{\Lambda})$ is a rotation in terms of the Euler-Rodrigues parameters and $\mathbf{r}$ is a generic space vector.

Frohes Schaffen!