

SPECIAL RELATIVITY HOMEWORK – WEEK 1

Exercise 1. *The space of rank-3 tensors T_{ijk} in \mathbb{R}^2 is a reducible representation of $SO(2)$. Using tensor operations, decompose this representation into irreducibles. What are the dimensions of the resulting irreducible representations?*

Exercise 2. *Consider rank- k tensors in \mathbb{R}^n . What is the number of independent components in:*

1. *A general such tensor $T_{i_1 i_2 \dots i_k}$?*
2. *A totally antisymmetric tensor $T_{i_1 i_2 \dots i_k} = T_{[i_1 i_2 \dots i_k]}$?*
3. *A totally symmetric tensor $T_{i_1 i_2 \dots i_k} = T_{(i_1 i_2 \dots i_k)}$?*