

## Topic 6 – Lie Groups and Lie Algebras

### Pre-Lecture Reading/Post-Lecture Summary

This will hurt a little....

In this lecture we will revisit the idea of comparing groups. For finite discrete groups we could use multiplication tables, but for continuous groups we need something more sophisticated. For many of the important continuous groups in physics they exhibit a special and very useful property called a Lie structure, i.e. they are Lie groups. We will learn what this means and understand how this relates to the Lie algebra of the generators of a continuous group. The generators are a formal way of talking about the "independent" types of transformations that can be done in a continuous group and corresponds to the continuous free parameter counting that we did previously. Exploring the example of rotations in 3D and the Lie group  $SO(3)$  we will use this abstract framework to unearth one of the most unusual new ideas in modern physics, that of a spinor about which we will see much more next time. Then you will leave and be happy.