

Problem Set 1 Due Feb 2 2010

- (1) How many elements does the group S_3 of permutations of three elements have? Find a faithful representation of S_3 in terms of two by two matrices. **Hint** Think of the effect on the co-ordinates of the vertices of an equilateral triangle when you permute them.
- (2) Calculate the Poisson brackets of the components of the angular momentum $\mathbf{L} = \mathbf{r} \times \mathbf{p}$. Find a faithful representation of this Lie algebra in terms of 3×3 real matrices and 2×2 anti-hermitean matrices.
- (3) Find an isomorphism of $sl(2, \mathcal{R})$ with the space of traceless real 2×2 matrices. Also, find a set of three functions of position and momentum with Poisson brackets isomorphic to $sl(2, \mathcal{R})$.