



MTH101 (Symmetry)

Assignment : 10 marks / Submit by : March 21, 2022 / 11:59 PM

Spring 2022

In this assignment write all details in your own words to exhibit that you have attained conceptual understanding of the relevant topics. Vague answers may not fetch credits.

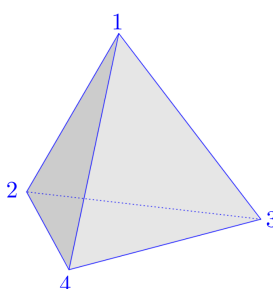
1. Recall the problem of 3 cups from Lecture 17 (March 09, 2022).



Problem Consider three inverted cups as shown in the picture. By switching the state (inverted / upright) of any two cups at a time, can you obtain the configuration where all three cups are in upright state?

- (a) Express this problem in terms of group action of Q_2 of Tutorial 07 (March 08, 2022).
- (b) How many orbits are there in this action? Justify your answer.
- (c) Argue, using this action, that the problem has a negative answer. That is, argue that it is impossible to make all three cups upright, by switching states of two cups at a time.

2. Consider a regular tetrahedron.



Show that the group of rotational symmetries of the tetrahedron is same as the group in the example (K) of Tutorial 06 (March 01, 2022).
