MAT 150C, Spring 2021
Homework 4

Due before 12:10 on Wednesday, May 5

Please write the homework solutions in connected sentences and explain your work. Mark the answers to each question. Scan or take pictures of your homework and upload it to Gradescope before due time.

1. Consider the permutation representation $S_3 \to GL(V),\ V = \mathbb{C}^3$.

(a) Compute the dimension of the space of S_3-invariant transformations from V to V.

(b) Find an explicit basis in this space.

2. Prove that complex numbers with absolute value 1 have the form $\{e^{i\theta}, \theta \in \mathbb{R}\}$ and form a group.

3. Find all **continuous** one-dimensional representations of the group from problem 2.

4. The character of a representation of $SU(2)$ has the form

$$\chi\begin{pmatrix}\alpha & 0\\ 0 & \alpha^{-1}\end{pmatrix} = \alpha^{-2} + 3\alpha^{-1} + 2 + 3\alpha + \alpha^2.$$

Decompose this representation into irreducibles.