MAT 150A HW07

[add your name here]

Due Tuesday, 11/28/23 at 11:59 pm on Gradescope

Reminder. *Your homework submission* **must be typed** *(TeX'ed) up in full sentences, with proper mathematical formatting.*

Covered in this HW   §6.7: abstract symmetry, group actions (i.e. group operations), orbits, stabilizers

Grading   Some of the (parts of) problems will be graded in detail out of several points, and necessary feedback will be given. The rest will be graded out of 2 points.

Exercise 1

Let $G = D_4$ be the dihedral group of symmetries of the square $[-1,1]^2 \subset \mathbb{R}^2$, generated by $\rho = \rho_{\pi/2}$ and τ reflection across the e_1-axis.

  (a) What is the stabilizer of the vertex $v = (1,1)$?

  (b) What is the stabilizer of the top edge e connecting $(-1,1)$ and $(1,1)$?

    You do not need to give a full proof of your answers; give a brief explanation to support your answer. For example, my answer for part (a) begins with "By inspection, the elements of D_4 that fix v are ..." and then identifies the physical meaning of the elements.

SOLUTION.

Exercise 2

Let $G = GL_n(\mathbb{R})$ act on the set $V = \mathbb{R}^n$ by left multiplication.

  (a) Describe the decomposition of V into orbits for this action.

  (b) What is the stabilizer of e_1?

  (c) Is this action of G on $V - \{0\}$ free, transitive, both, or neither?

SOLUTION.