November 23, 2019

18.701 Problem Set 10

This assignment is due Wednesday, December 11, the last day of class.
Please turn it in on time. We need to grade it promptly in order to
determine final grades.

1. (*real* 2×2 *matrices with determinant* 1)

(a) Let SL_2 be the special linear group of real matrices with determinant 1. Determine the possible eigenvalues λ (real or complex) of the elements of SL_2, and make a drawing showing the points λ in the complex plane.

(b) For each λ, decompose the set of matrices $P \in SL_2$ with eigenvalue λ into SL_2-conjugacy classes .

(c) Determine the matrices $P \in SL_2$ that can be obtained as $P = e^A$ for some real matrix A.

2. Chapter 8, Exercise M.1 (*visualizing Sylvester's law*)

3. Chapter 8, Exercise M.15 (*harmonic polynomials*)

4. Chapter 9, Exercise 6.9a. (*vector cross product*)