MATH 402 Homework 9

Due Friday 16 November, 2018

Exercise 1. Let P_n be a regular n-gon, and let G be its symmetry group.

(a) Show that G is a *finite* symmetry group, by proving that there is an injective function from G into the set of permutations of n objects.

(b) Show that G is the dihedral group D_n (i.e. it has exactly n rotations and n reflections). *Hints: it is enough to (a) prove that it is not cyclic and (b) prove that it has a rotation of order n, although you must explain why this is enough. Review the things we proved for the pentagon.*

(c) Draw a figure whose symmetry group is cyclic, not dihedral.

Exercise 2. Let ℓ and m be limiting parallel hyperbolic lines. Prove that they cannot have a common perpendicular. *Hint: consider angles of parallelism.*

Exercise 3. Let ℓ and m be limiting parallel hyperbolic lines. Let r_ℓ denote reflection across ℓ, and let $m' = r_\ell(m)$. Prove that m' is also limiting parallel to ℓ.

Remember that in addition to the points assigned to each question, you will receive up to five further points for neatness and organization.