

Math 541: Hyperbolic 3-Manifolds
Homework 2

1-3. Do Exercises 2.9, 2.10, and 2.11 from Purcell.

4. Show that the definition of the developing map does not depend on the choice of curve α representing the class $[\alpha]$, the choice of t_i for $i \geq 1$, or the choice of charts (U_i, ϕ_i) for $i \geq 1$. Show that a change of the basepoint x_0 and initial chart (U_0, ϕ_0) changes the developing map by composition with an element of G , and changes the holonomy group by conjugation in G .

5. Let T be a torus with an affine structure. Show that T is complete as an $(\text{Aff}(\mathbb{R}^2), \mathbb{R}^2)$ -manifold if and only if its affine structure can be strengthened to a $(\text{Isom}(\mathbb{E}^2), \mathbb{E}^2)$ -structure (i.e., transition maps are Euclidean isometries and fundamental domains are parallelograms).