

## HWK #2, DUE WEDNESDAY 10/23

1. Hartshorne I, 1.12
2. A **groupoid** is a category in which every morphism is an isomorphism. Show that one could define a group as a small groupoid with one object.
3. Given two categories  $\mathcal{C}$  (which we assume is locally small, for technical reasons) and  $\mathcal{D}$ , show that one can form a category  $\text{Fun}(\mathcal{C}, \mathcal{D})$ , whose objects are the functors from  $\mathcal{C}$  to  $\mathcal{D}$  and whose morphisms are natural transformations between functors.
4. Prove Yoneda's Lemma.
5. Hartshorne I, 3.2