

**MATH 109 WINTER 2007 HOMEWORK 8, DUE 3/9/07 IN
CLASS**

(All exercise and page numbers refer to Eccles.)

1. READING AND PRACTICE

Read Chapters 22, 10, 11, 12 of the text, and do as many of the end of chapter exercises as possible.

2. EXERCISES TO SUBMIT ON FRIDAY 3/9

1. In the Exercises V which begin on page 271, do #17(i)(ii)(iv).

2. Consider the set $\mathbb{R}^2 = \mathbb{R} \times \mathbb{R} = \{(a, b) | a, b \in \mathbb{R}\}$, that is, the real cartesian plane. Define a relation on \mathbb{R}^2 by declaring $(a, b) \sim (c, d)$ if and only if $ab = cd$.
 - (a) Prove that \sim is an equivalence relation.

 - (b) Describe geometrically what the equivalence classes of \sim and the corresponding partition of \mathbb{R}^2 look like. (Careful! There may be some “special” equivalence classes which don’t have the same shape as the others. Make sure you describe those too.)

3. This problem describes an equivalence relation important in algebra. Let $A = \{(a, b) | a, b \in \mathbb{Z}, b \neq 0\}$. In words, A is the set of ordered pairs of integers in which the second coordinate is not zero. Define a relation on the set A as follows. For (a, b) and (c, d) in A , define $(a, b) \sim (c, d)$ if and only if $ad = bc$.
 - (a). Prove that \sim is an equivalence relation on A .

 - (b). Prove that given $(a, b) \in A$, the equivalence class $[(a, b)]$ consists exactly of the set of those ordered pairs $(c, d) \in A$ such that the fractions a/b and c/d are equal as rational numbers in \mathbb{Q} .

4. In the Exercises III which begin on page 182, do #1, 2, 12, 14.