Math 108, problem set 04
REVISED THU FEB 21
Outline due: Wed Feb 20
Completed version due: Mon Feb 25
Last revision due: Mon Mar 17

Definitions:

block If $\{A_\alpha \mid \alpha \in I\}$ is a partition of a set X, we call the A_α the **blocks** of the partition.

Exercises (to be done but not turned in): 10.1, 10.3, 11.2, 11.5.
Problems to be turned in: All numbers refer to problems in the Yellow Book.

1. 10.1(i).
2. 10.3.
3. Define a relation $\sim$ on $\mathbf{R}^2$ by saying that $(x_1, x_2) \sim (y_1, y_2)$ if and only if at least one of $x_1 - y_1$ and $x_2 - y_2$ is an integer. Determine whether or not this relation is reflexive, symmetric, or transitive. If a property holds, prove that it holds; if it does not, prove that it does not. If the relation is an equivalence relation, give the equivalence class of a general point.
4. 10.5.
5. 11.1(i).
6. The set of all straight lines with slope 1 (i.e., $y = x$, $y = x + 1$, etc.) form a partition of $\mathbf{R}^2$. Choose an equivalence relation $\sim$ whose equivalence classes are the blocks of this partition, and prove that the equivalence classes of your chosen $\sim$ actually are the straight lines with slope 1.
7. Suppose that X and Y are nonempty disjoint sets, and for two nonempty disjoint sets I and J, suppose that $\{A_\alpha | \alpha \in I\}$ and $\{A_\alpha | \alpha \in J\}$ are partitions of X and Y, respectively. Prove that $\{A_\alpha | \alpha \in I \cup J\}$ is a partition of $X \cup Y$.