Name:
Collaborators:
Outside resources:

Math 2106, Foundations of Mathematical Proof
HW 4 — Due Feb 27, 2017 (Monday)

Turn in the following problems from Hammack's book:
Chapter 10, Problems 8, 10, 16, 18.
Section 11.1, Problems 4, 8, 10, 12.
Section 11.2, Problems 2, 4, 6, 8, 10, 12.
Section 11.3, Problems 2, 4.
Section 11.4, Problems 4, 6, 8.

Additional exercises (to be turned in)

A1 Prove that for every real number $x > -1$ and every positive integer n, $(1+x)^n \geq 1+nx$.

A2 Prove that for any integer $n \geq 3$, the sum of the interior angles of an n-sided polygon is $(n-2) \cdot 180°$. (You may assume that the statement is true for $n = 3$.)

A3 Suppose a plane is divided into some number of regions by a finite number of infinitely long straight lines. Show that the regions can be colored with two colors so that no two adjacent regions have the same color.

A4 Prove that you can cut a square into n smaller squares (which may have different sizes), for all integers $n \geq 6$.

A5 Let R be the relation on $(\mathbb{Z} \times \mathbb{Z}) - \{(0,0)\}$ such that $(a,b)R(c,d)$ if and only if $ad = bc$.

(a) Prove that R is an equivalence relation.

(b) What is the equivalence class of $(1,2)$ under this relation?

(c) Give a description of all the equivalence classes.

A6 Let H be a nonempty subset of $\mathbb{Z}$ and let $R = \{(a,b) \in \mathbb{Z} \times \mathbb{Z} : a - b \in H\}$. Suppose R is an equivalence relation on $\mathbb{Z}$. Prove the following.

(a) $0 \in H$

(b) For any $a \in \mathbb{Z}$, if $a \in H$, then $-a \in H$.

(c) For any $a, b \in \mathbb{Z}$, if $a, b \in H$, then $a + b \in H$.