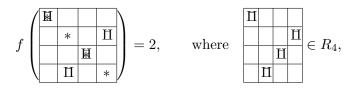
Math 2001: Homework P11

Due: November 20, 2013

- 1. From the book do problems:
 - (a) 5.2: 6, 8
 - (b) 5.4: 4, 5
 - (c) 6.1: 5, 10, 12
- 2. Let A be a set with n elements.
 - (a) How many reflexive relations are there on A?
 - (b) How many symmetric, reflexive relations are there on A?
 - (c) How many equivalence relations are there of A, if n = 5?
- 3. Let R_n be the set of ways to place n non-attacking rooks on an $n \times n$ chess-board.
 - (a) Let $f: R_n \to \mathbb{Z}$ be given by

f(r) = number of rooks on the diagonal squares of r, for $r \in R_n$.

For example, if n = 4,



and I've marked the diagonal squares with *.

- i. What is $f(R_n)$?
- ii. Is f injective?
- iii. Is f surjective?
- iv. Find $|f^{-1}(k)|$ for all $k \in f(R_4)$.
- (b) Find an injective function $g: R_n \to \mathbb{Z}$ (without changing the sets R_n and \mathbb{Z}).