Math 2001 - Assignment 12

Due April 20, 2018

(1) List the equivalence classes for these equivalence relations:
   (a) The relation "has the same size" on the power set of $\{1, 2, 3\}$
   (b) $\equiv_n$ on $\mathbb{Z}$
   (c) $R = \{(x, y) \in \mathbb{Z} \colon |x| = |y|\}$ on $\mathbb{Z}$
(2) How many different equivalence relations are there on $A = \{1, 2, 3\}$? Describe them all by listing their equivalence classes.
(3) Given finite sets A and B. How many different relations are there from A to B?
(4) Let $\sim$ be an equivalence relation on a set A, let $a, b \in A$. Let $[a]$ denote the equivalence class of a modulo $\sim$. Show that
$$a \not\sim b \text{ iff } [a] \cap [b] = \emptyset.$$
(5) Give the addition and multiplication tables for $\mathbb{Z}_6$.
(6) Dividing in $\mathbb{Z}_n$ means solving an equation $[a] \cdot [x] = [b]$ for $[x]$.
   Solve $[8] \cdot [x] = [1]$ in $\mathbb{Z}_{37}$.
   Hint: Use the Euclidean algorithm to solve $8x \equiv 1 \mod 37$.