MS121 Discrete Mathematics, Tutorial 5

1. Consider the relations '$<$' (less than), '$\leq$' (less than or equal to) on the set $\mathbb{R}$ of real numbers. Are these relations reflexive, symmetric, antisymmetric, transitive?

2. Consider the relations '$\subseteq$' (contained in), '$\subsetneq$' (contained in but not equal to equal to) on the set $P(A)$ of subsets of a set A. Are these relations reflexive, symmetric, antisymmetric, transitive?

3. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$ and define the relation R on A by $(a, b) \in R$ if and only if $b - a$ is a multiple of 5. R is an equivalence relation. (The proof is similar to the case where $b - a$ is a multiple of 2.) What is the equivaence class of 1? Of 2? Of 6? What is the partition of A defined by R? Draw the digraph of R.

4. Let R be the relation on $A = \{1, 2, 3, 4, 5, 6\}$ given by

$$R = \{(1, 3), (2, 4), (3, 5), (4, 6), (5, 1), (6, 2)\}.$$

Represent R as a digraph. Let R' be the transitive closure of R. Compute R' as a set of pairs. Show that R' is an equivalence relation and determine the partition of A defined by R'.