## Examlet 4A Foundations of Advanced Math 4/19/13

1. a) State the definition of a reflexive relation.
b) Give an example of a relation on the set $\{a, b, c\}$ which is transitive but not symmetric.
2. Let $S=\{1,2,3,4,5\}$, and consider the partition $\mathscr{P}=\{\{1,2\},\{3,4,5\}\}$ of $S$. Write the equivalence relation $\sim$ corresponding to $\mathscr{P}$.
3. a) Express the definition of an injective function formally in terms of ordered pairs.
b) Express the definition of an even function formally in terms of ordered pairs.
4. Let $S$ be a set and $\mathscr{P}$ a partition of $S$.
a) The relation on $S$ defined by $a \sim b$ iff $\exists P \in \mathscr{P}$ for which $a, b \in P$ is a reflexive relation.
b) The relation on $S$ defined by $a \sim b$ iff $\exists P \in \mathscr{P}$ for which $a, b \in P$ is a symmetric relation.
c) The relation on $S$ defined by $a \sim b$ iff $\exists P \in \mathscr{P}$ for which $a, b \in P$ is a transitive relation.
5. Say that two vertices $v_{1}$ and $v_{2}$ of a graph $G$ are propinquous iff there exists a walk between them that contains exactly one vertex other than $v_{1}$ and $v_{2}$.
a) Is the relation of being propinquous reflexive?
b) Is the relation of being propinquous symmetric?
c) Is the relation of being propinquous transitive?
