

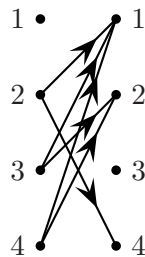
## Second Quiz for CSI35

Nikos Apostolakis

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**Directions:** This quiz is due Thursday October 19, at 6:00 PM.

1. Consider the relation  $R$  whose directed graph is shown below



- (a) Write  $R$  as a set of ordered pairs.
  - (b) Determine whether  $R$  is reflexive, symmetric antisymmetric, or transitive.
  - (c) Find  $R^2$ .
2. Let  $R$  be the “auntle” relation on the set of all humans:  $(a, b) \in R$  if and only if,  $a$  is an aunt or an uncle of  $b$  (in other words  $R$  is the composition  $P \circ S$  where  $P$  is the “parent relation” and  $S$  is the “sibling” relation). What are the compositions  $P \circ R$  and  $R \circ P$ ?
  3. Let  $A = \{0, 1\}$ .
    - (a) How many (binary) relations are there on  $A$ ? List all of them.
    - (b) Which of the relations you listed in par (a) are reflexive? Which are symmetric? Which are antisymmetric? Which are transitive?
    - (c) How many relations of degree 3 (i.e. 3-ary relations) are there in  $A$ ?
  4. Let  $R$  be a relation on  $A$ . Is it possible  $R$  to be a function and reflexive? If yes give an example, if no explain why not.
  5. **Extra Credit** Let  $A$  be a set of cardinality  $n$ . How many *symmetric* relations are there on  $A$ ?