

## CSI 35, Homework 2 on section 9.3.

Due by Wed, Feb 19.

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Write all your working out and answers neatly by hand on your own notepaper, using lots of space so I can include corrections or comments. Otherwise I may deduct points or ask you to redo it. It is very important that you show clearly any work you had to do to get your answers. Just writing the answer down with no work shown is usually not enough. Each question is worth 5 points.

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### Section 9.3 Representing relations

- (1) Represent the relation  $\{(2, 4), (3, 1), (3, 2), (3, 4)\}$  on the set  $\{1, 2, 3, 4\}$  with a matrix, using the usual increasing order.
- (2) List the ordered pairs for the relation on the set  $\{1, 2, 3, 4\}$  given by this matrix, with rows and columns listed in increasing order:

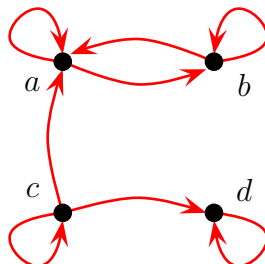
$$\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$$

- (3) Suppose the matrix for the relation  $R$  is given by

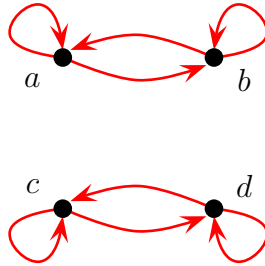
$$M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}.$$

Decide which of these properties the relation  $R$  has: reflexive, symmetric or antisymmetric. Give a short explanation for each.

- (4) For the same  $M_R$  as in the last question, compute the matrix product  $M_R \cdot M_R$  and then the Boolean product  $M_R \odot M_R$ . Use this to decide if  $R$  is transitive.
- (5) List the ordered pairs in the relation represented by this directed graph:



- (6) For the relation given by the digraph in the last question, decide which of these properties it has: reflexive, symmetric, antisymmetric or transitive. Give a short explanation for each.
- (7) For the relation on  $\{a, b, c, d\}$  given by this digraph



decide which of these properties it has: reflexive, symmetric, antisymmetric or transitive. Give a short explanation for each.

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If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes or section in the textbook.
- Ask me about it after class.
- Come to my office hours: Mon 2:00 - 3:00, Wed 2:00 - 3:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.