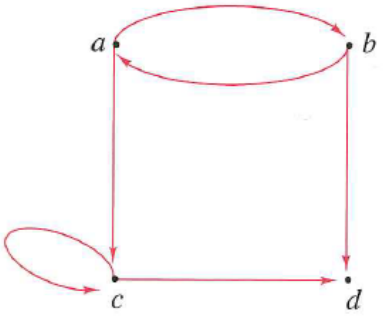
BM20A8800 Discrete Models and Methods 3op

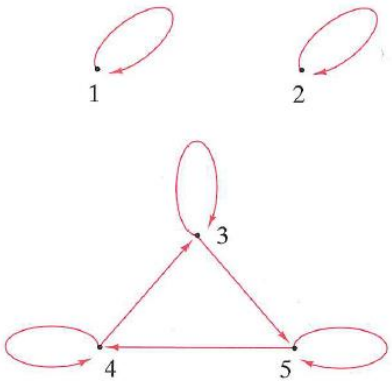
Exercise 5 / Week 7

1. Define the relation matrices for following digraphs. (Loops in c) look weird, don't get confused.)

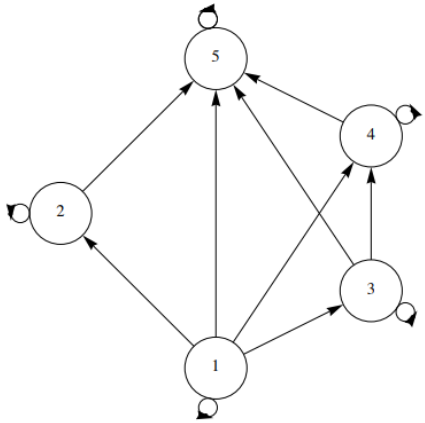
a)



b)



c)



2. Let R_1 and R_2 be relations in set {1,2,3,4}. The ordered pairs for these relations are following:

$R_1 = \{(1,1), (1,2), (3,4), (4,2)\}$ $R_2 = \{(1,1), (2,1), (3,1), (4,4), (2,2)\}$

a) Define: i: $R_1 \cup R_2$ ii: $R_1 \cap R_2$ iii: $R_1 \circ R_2$ iv: $R_2 \circ R_1$

Present the results as relation matrices.

b) Draw digraphs of relations $R_1 \cup R_2$ and $R_1 \circ R_2$.

3. a) Let's define relation R in set {1,2,3,4} in following fashion: $(x, y) \in R \; if \; x^2 \geq y$. Define the ordered pairs of this relation and present them in the form of a digraph.

b) Same question as in a), but now R is in set {1,3,5,7,9} and its definition is $(x, y) \in R \; if \; 4x + y^2 \geq 60$.

4. Let's examine relation $R = \{(0,1), (1,1), (1,2), (2,0), (2,2), (3,0)\}$ which is defined in set $X = \{0,1,2,3\}$. Draw the digraph for this original relation and then define its

a) reflexive closure b) symmetric closure c) transitive closure

Present your solutions in the form of a digraph for each section.

5. a) Let's examine a set $X = \{1,2,3,4,5\}$ in which we have defined the relation $R = \{(1,1), (2,3), (3,3), (3,4)\}$. Is this an equivalence relation? If is isn't, make it into a one by formulating a such closure for it. Use either a digraph or matrices in order to do this.

b) What are the equivalence classes of the equivalence relation (original, or the formulated closure) in section a)?

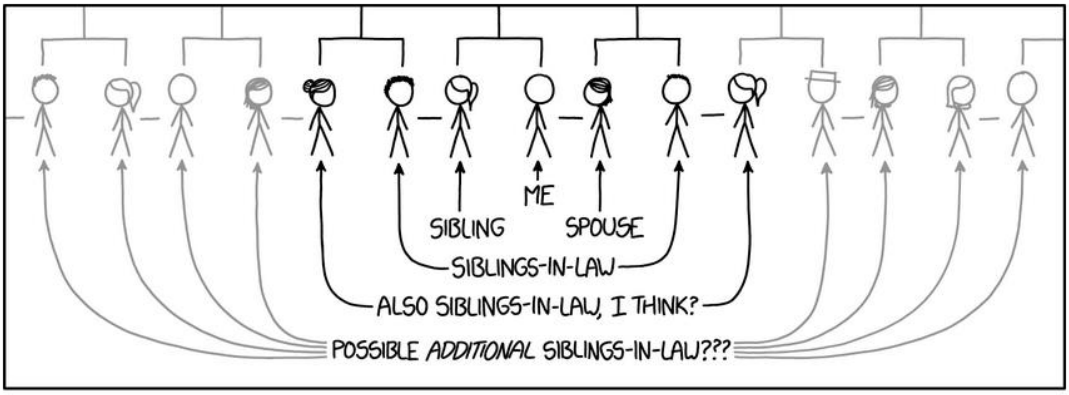
6. a) In set $X = \{3,4,5\}$ let we define a relation $R = \{(5,5), (5,3), (3,3), (3,4), (4,4), (5,4)\}$. Is this relation a partial order, total order or neither? Examine using either a digraph or relation matrices.

b) In set $X = \{1,2,3,4,5,6,7,8\}$ let us define a relation $x\ R\ y\ \ if\ y\ is\ divisible\ by\ x$.

i) Define the ordered pairs of this relation and draw a digraph.

ii) Draw a Hasse diagram.

iii) Is this relation a partial order, total order or neither?



PEOPLE COMPLAIN THAT "<X>TH COUSIN <Y> TIMES REMOVED" IS HARD TO UNDERSTAND, BUT TO ME THE MOST CONFUSING ONE IS SIBLING-IN-LAW, BECAUSE IT CHAINS ACROSS BOTH SIBLING AND MARRIAGE LINKS AND I DON'T REALLY KNOW WHERE IT STOPS.

Answers/hints for selected problems:

1. Checking hint: the number of 1s in relation matrix must match the number of arrows in the digraph.

4. c) there are 12 elements in t(R).

5. b) there are 3 of them.