Discrete Mathematics — Tutorial Sheet 04 — Relations BSc (H) in App Comp, Ent Sys, Comp Foren, and the IoT

Into/Onto and One-to-One

See questions in notes.

Question 1

For each of the following relations R defined on set $A = \{1, 2, 3, ...\}$, determine which of the given ordered pairs belong to R

(a) $(x, y) \in R$ iff x|y; (2, 3), (2, 4), (2, 8), (2, 17) (b) $(x, y) \in R$ iff $x \le y$; (2, 3), (3, 2), (2, 4), (5, 8)

(c) $(x,y) \in R$ iff $y = x^2$; (1,1), (2, 3), (2, 4), (2, 6)

Properties of Relation on a Set

Question 2

Consider the relations represented in the following graphs.

- Determine whether the given relations are reflexive, symmetric, antisymmetric, or transitive.
- Determine which relations are asymmetric, irreflexive.
- Which of the graphs are of equivalence relations?
- Construct the transitive closure of each relation.



Question 3

Consider the relation on $\{1, 2, 3, 4, 5, 6\}$ defined by $R = \{(i, j) : | i - j | = 2\}.$

- Is R reflexive? (c) Is *R* transitive? (a)
- Is R symmetric? (d) Draw a digraph of *R*. (b)

Question 4

Determine which of the following are equivalence relations for the given sets:

- $A = \{$ lines in the plane $\}$, and R defined by $(x, y) \in R$ if and only if x is parallel to y. (a)
- $A=\mathbb{R} \text{ and relation } R \text{ defined by } (x,y) \in R \text{ if and only if } |x-y| \leq 7.$ (b)