Relations Tutorial

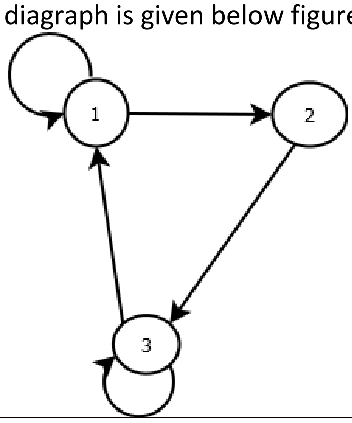
1. Determine whether the relation *R* on the set of all integers is reflexive, symmetric, antisymmetric, and/or transitive, where *(x, y)* ∈*R* if and only if
a) $x\_= y$.
b) $xy \geq 1$.
c) $x= y + 1$ or $x = y - 1$.
d) $x \equiv y$ (mod 7).
e) *x* is a multiple of *y*.
f) *x* and *y* are both negative or both nonnegative.
g) $x= y2$.
h) $x \geq y2$.

2. For each of these relations on the set {1, 2, 3, 4}, decidewhether it is reflexive, whether it is symmetric, whetherit is antisymmetric, and whether it is transitive.
a) {(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)}
b) {(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)}
c) {(2, 4), (4, 2)}
d) {(1, 2), (2, 3), (3, 4)}
e) {(1, 1), (2, 2), (3, 3), (4, 4)}
f) {(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)}

3. Let Z be the set of integers and let R be the relation called "congruent modulo 5" defined by $R = \{(x, y) \mid x \in Z, y \in Z \; and \; (x - y) isdivisible \; by \; 5\}\}$ Determine equivalence classes generated by the element of Z.

4. Let A={1,2,3} Determine whether the relation R whose matrix M_{R1} , M_{R2} is given is an equivalence relation.
a) $M_{R1}=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$
b) $MR2=\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

5. Determine whether relation whose diagraph is given below figure is an equivalence relation.



6. Let $R = \{(1,2), (3,4), (2,2)\}$ and $S = \{(4,2), (2,5), (3,1), (1,3)\}$ Find RoS, S o R, (R o S) o R, RoR, SoS and (R o R) o R