$A = \{1, 2, 3, 4\}$

R/IR   S/A/Anti   Transi

Determine whether relation is reflexive, irreflexive, symmetric, asymmetric, antisymmetric or transitive

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

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

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

$(4,4) \notin R$

3) $R = \{(1,1), (2,2), (3,3)\}$

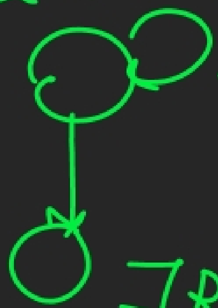
4) $R = \{(1,2), (1,3), (3,1), (1,1), (3,3), (3,2), (1,4), (4,2), (3,4)\}$

5) $R = \{(1,3), (4,2), (2,4), (3,1), (2,2)\}$

$$\begin{array}{c|ccc} & a & b & c \\ \hline a & & & \\ b & & \left[\begin{matrix}1 & & \\ & 1 & \\ & & 1\end{matrix}\right] & \\ c & & & \end{array}
\qquad
\begin{array}{c|ccc} & a & b & c \\ \hline a & & & \\ b & & \left[\begin{matrix}0 & & \\ & 0 & \\ & & 0\end{matrix}\right] & \\ c & & & \end{array}
\qquad
\left(\begin{matrix}1 & & \\ & 1 & \\ & & 0\end{matrix}\right)$$

$a \to a$ for all $x \in R$

for some $x \in R$



IR/R S/A/Anti Tra

$$\left[\begin{matrix}0 & & \\ & 1 & \\ & & 0\end{matrix}\right] \qquad \left(\begin{matrix}1 & & \\ & 1 & \\ & & 0\end{matrix}\right)$$

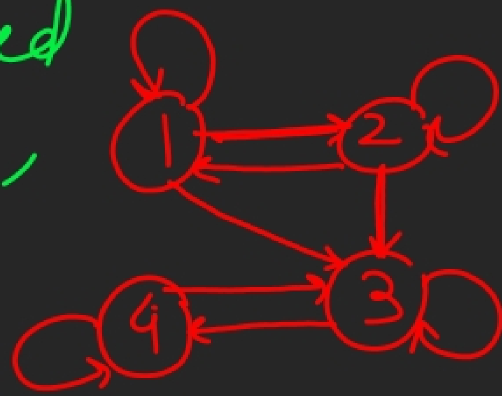
a, b, c

$a \to b, b \to c$

$a \to c$

Equivalence Relation

A relation R on set A is called equivalence if it is reflexive, symmetric and transitive



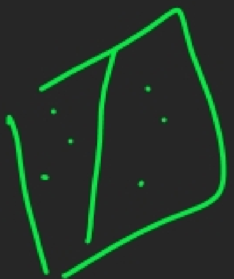
Let $A = \{1, 2, 3, 4\}$

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

Equivalence Relations and Partitions

Let P be a partition of set A.
relation R on A is aRb if and only if
a and b are members of same block
Then R is equivalence relation on A

Proof: a) If $a \in A$, then aRa
b) If aRb then a and b are same block, so bRa
c) If aRb and bRc, then $a, b,$ and c lie in same block of P so aRc



$A = \{1,2,3,4\}$

$P = \{\{1,2,3\},\{4\}\}$ of A

Find equivalence relation R on A determined by P

→ The blocks of P are $\{1,2,3\}$ and $\{4\}$. Each element in a block is related to every other element in the same block and only to those elements.

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