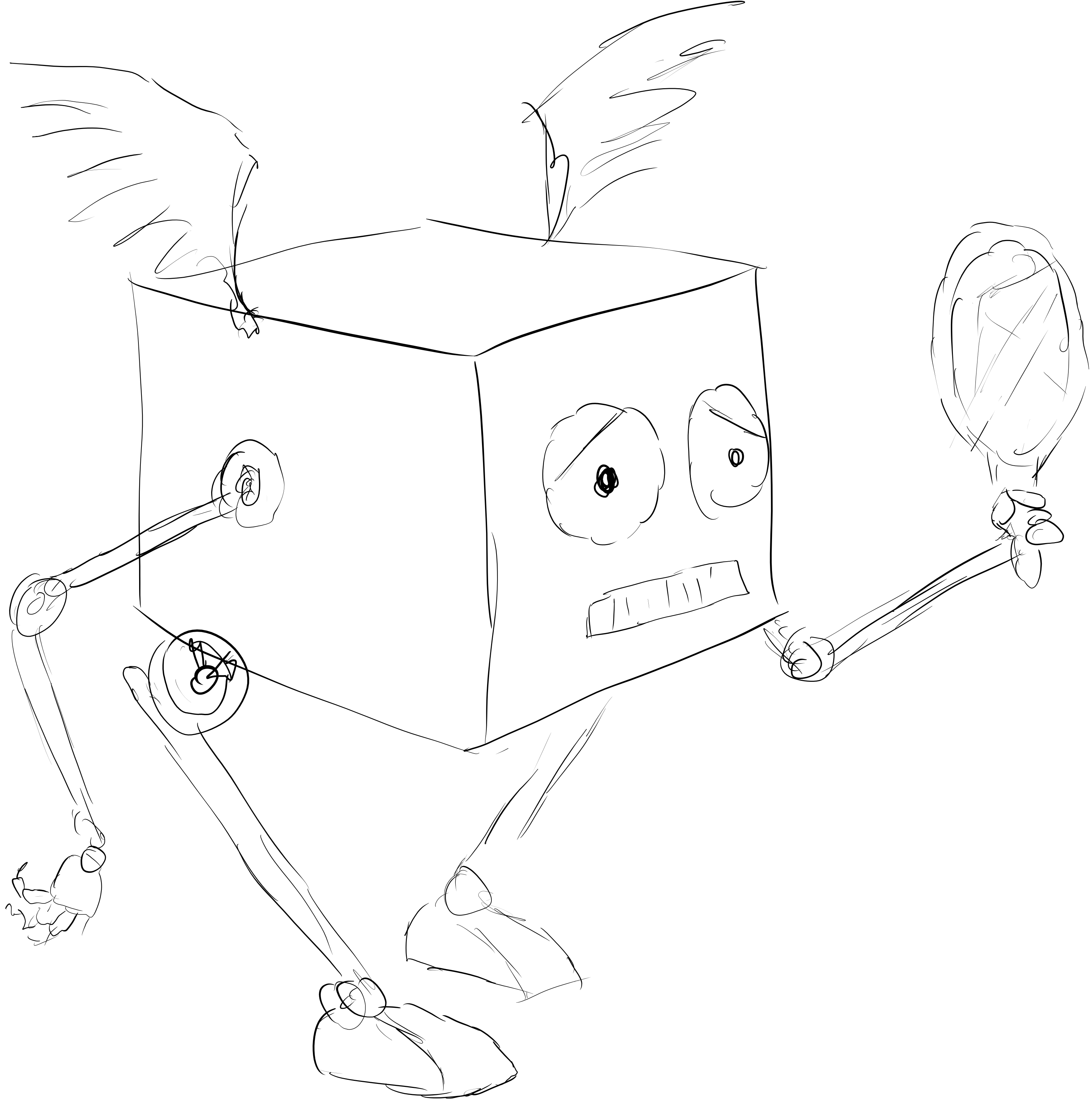


DAG

walk $v\ e\ v\ e \dots v$

path

cycle

DAG

$|\cdot|$ length of walk

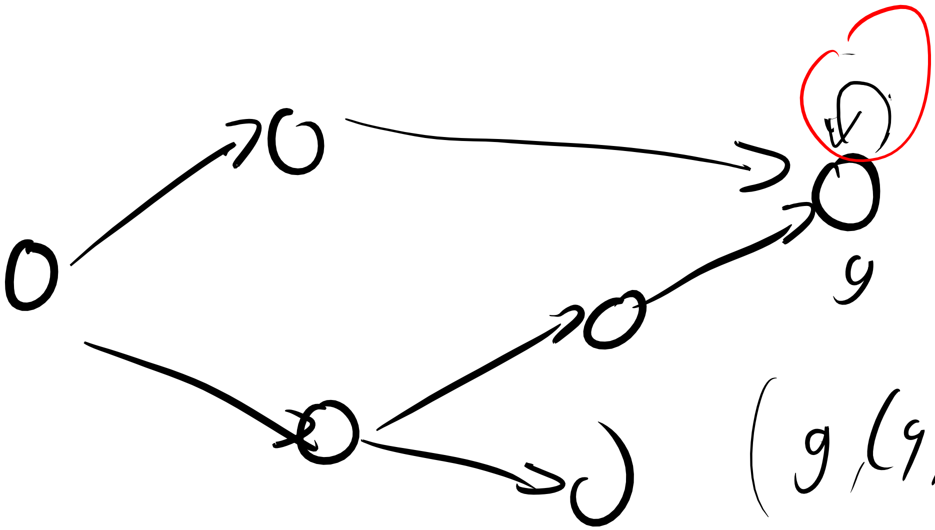
\# edges in

degree

in

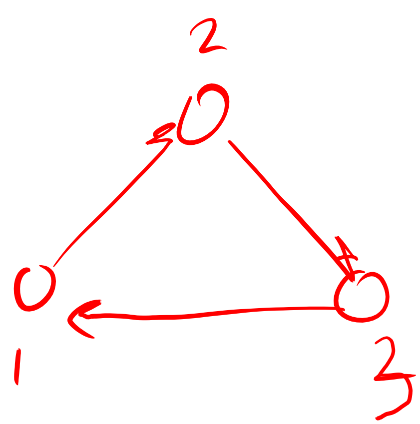
out

non-DAG



$(g, (g,g), g)$

(g)



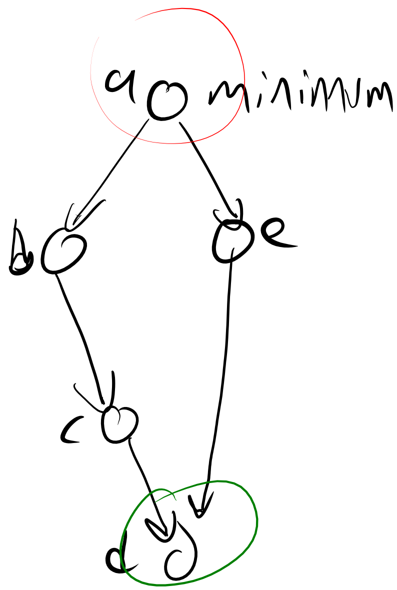
$(1, (1,2), 2, (2,3), 3, (3,1), 1)$

2 3 1 2

3 1 2 3

minimum / minimal } vertex in DAG
maximum / maximal

Maximum = reached by all
Maximal = cannot reach any



2 minimum m_0, m_1

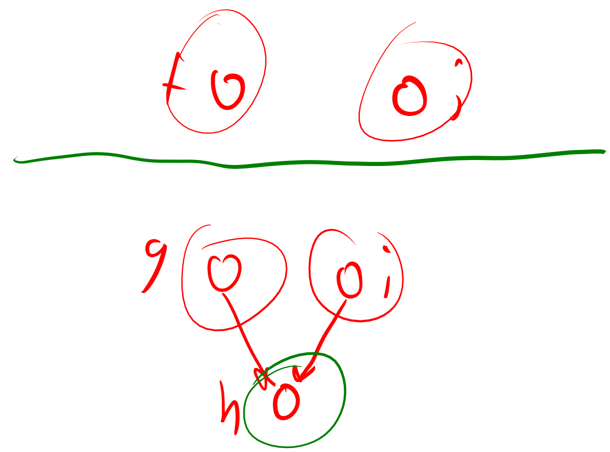
$\exists$ walk w_0: $m_0 \dots m_1$

$\exists$ walk w_1: $m_1 \dots m_0$

$w_0 \frown w_1 \to$ cycle

$m_0 \dots m_1 \dots m_0$

minimal



relations , graph of

$R : A \to B$

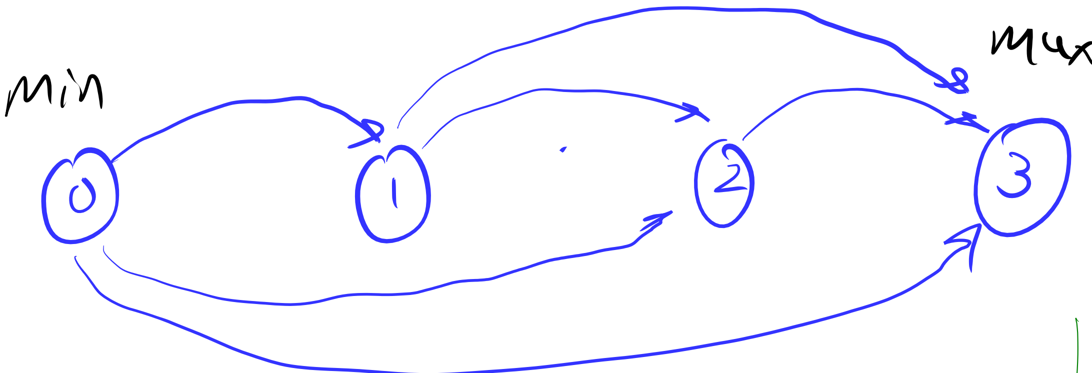
$\forall a \in A, b \in B.\ R(a, b) \in \{\top, \bot\}$

$\boxed{<} : \mathbb{R} \to \mathbb{R}$

$2.7 \boxed{<} \frac{\pi}{e^{13}} \equiv \bot$

$<\left(2.7, \frac{\pi}{e^{13}}\right)$

$<$ $\{0, 1, 2, 3\}$ (a, b) iff $R(a, b)$



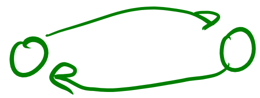
minimum

maximum

$R(a,b) \wedge R(b,c) \rightarrow R(a,c)$

Transitive

$\exists$ walk from x to y, $\rightarrow$ $\exists$ walk of length 1 from x to y

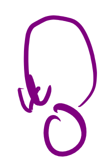
Symetric  $R(a,b) \leftrightarrow R(b,a)$

asymetric

anti symetric $a \neq b \rightarrow$ $R(a,b) \rightarrow \neg R(b,a)$

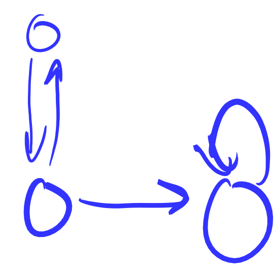
$<$ a symetric irreflexive

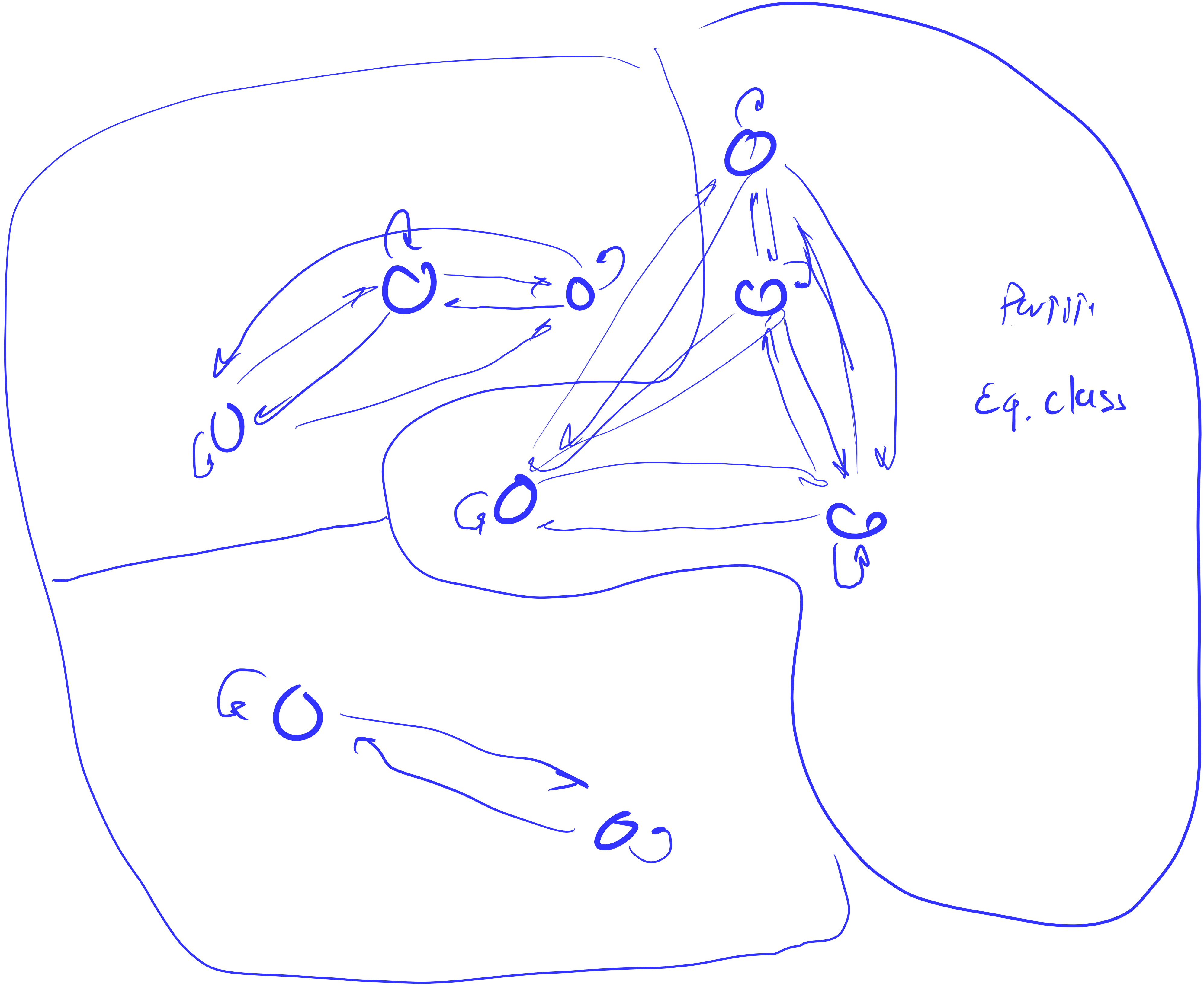
$\leq$ anti symetric reflexive



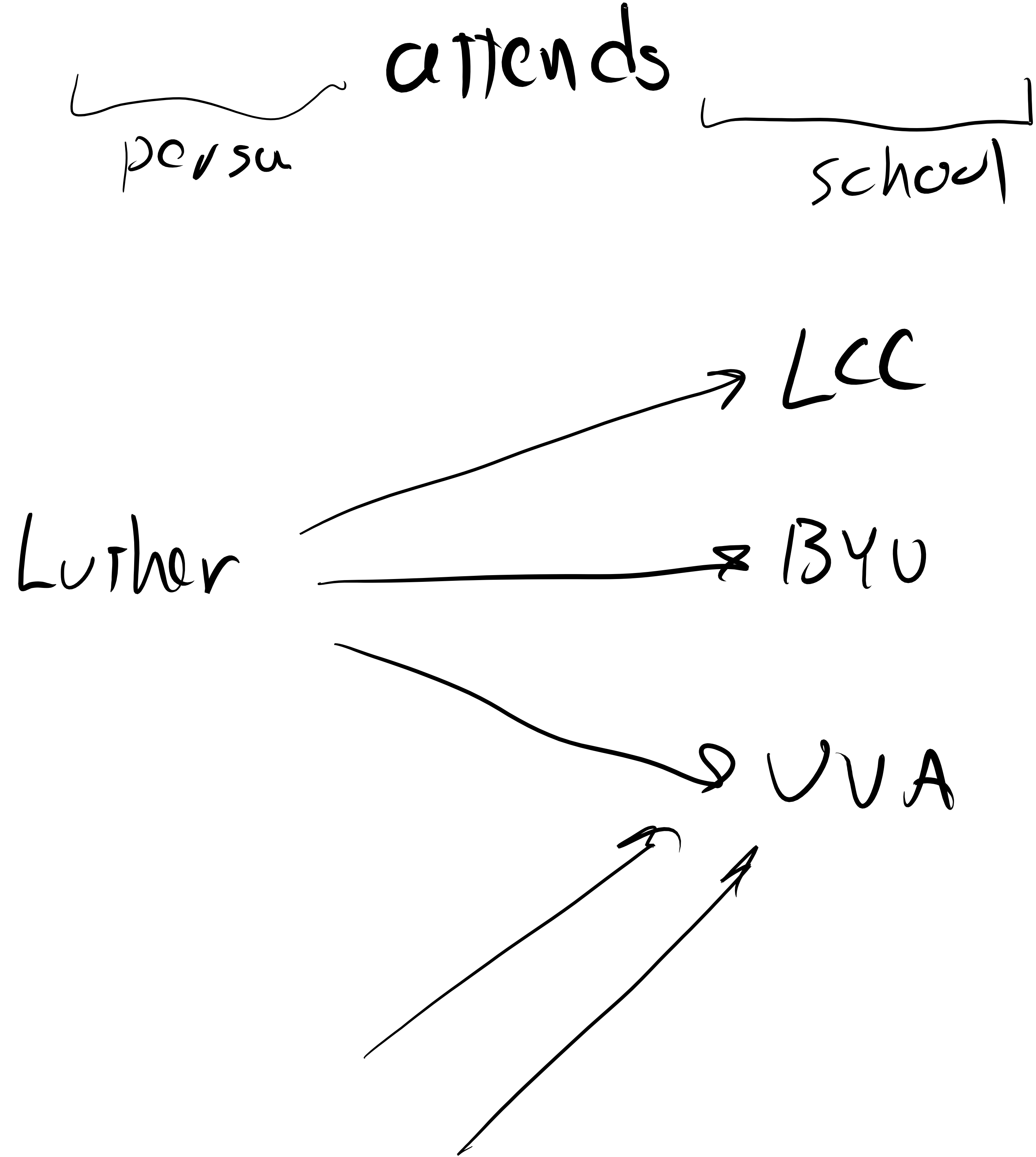
reflexive $\forall a. R(a,a)$

irreflexive $\forall a. \neg R(a,a)$





Partition
Eq. class


attends
persu
school
LCC
Luther
BYU
UVA