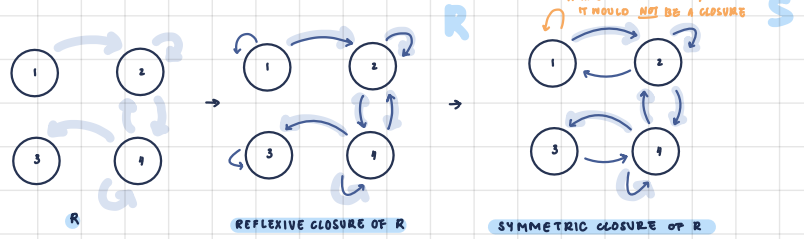


CLOSURE OF A RELATION w/ RESPECT TO PROPERTY P

- 1 HAS PROPERTY P ex: reflexive closure, reflexive = property p
- 2 IS A SUPERSET OF THE ORIGINAL RELATION
- 3 IS A SUBSET OF EVERY RELATION WHICH SATISFIES 1 + 2

ONLY ADD EDGES WHEN WE NEED TO!



WISE WORDS OF WILSON:

INVERSE OF THE RELATION \neq INVERSE OF THE MATRIX THAT REPRESENTS THE RELATION

INVERSE OF THE RELATION = TRANSPOSE OF THE MATRIX OF THE RELATION (FLIP ROW & COL)

$$R = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

$$\text{REFLEXIVE CLOSURE OF } R = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

$$\text{SYMMETRIC CLOSURE OF } R = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

SYMMETRY ✓

$$\text{TRANSPOSE MATRIX} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

NOW WE WANT THE
TRANSPOSE MATRIX
(INVERSE OF RELATION R)
BUT NOT THE INVERSE MATRIX

$$\text{INVERSE OF } R = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

UNION OF R + INVERSE R
= SYMMETRIC CLOSURE B

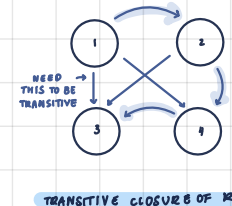
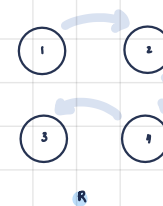
NOW WE WANT THE TRANSITIVE CLOSURE OF R

TAKE THE MATRIX OF R +
OR
FLIP IT SYMMETRICALLY
EX. IF $1R2$, in the inverse of R , $2R1$
EXCHANGE THE VALUES

THIS IS THE SAME AS THE

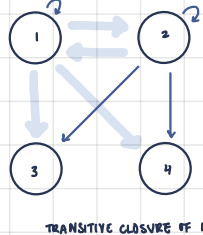
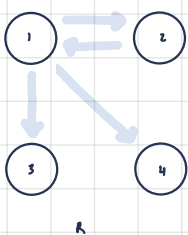
CONNECTIVITY RELATION R^*

(We want to include (a,b) in the
transitive closure of R iff there is a path of
1 or more steps from a to b in R)

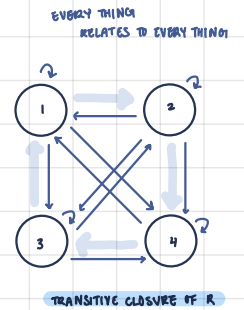
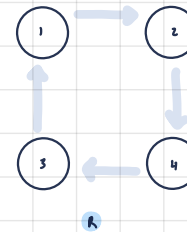


DONT NEED $3R1$ BUT
NEED $1R3$ BECAUSE
 $1R2 + 2R3$

NOW LET'S LOOK AT THIS: MORE TRANSITIVE!



$1R2 + 2R1$ SO NEED
 $1R1 + 1R2$ IN TRANSITIVE CLOSURE

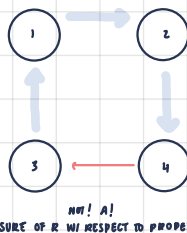
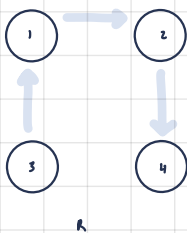


EVERY THING
RELATES TO EVERY THING!

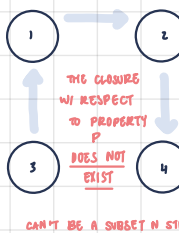
ANOTHER BAD PROPERTY YOU CANNOT TAKE
THE CLOSURE OF!

ANTI-SYMMETRIC

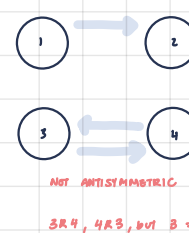
NOW, LET PROPERTY P BE "NOT" "EVERY ELEMENT IS RELATED TO THE SAME # OF ELEMENTS"



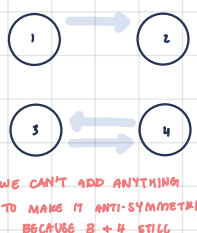
NOT A!
CLOSURE OF R w/ RESPECT TO PROPERTY P



CANT BE A SUBSET N STILL
RELATE TO SAME # OF ITEMS



NOT ANTI-SYMMETRIC
 $3R4, 4R3$, BUT $3 \neq 4$



WE CANT ADD ANYTHING
TO MAKE IT ANTI-SYMMETRIC
BECAUSE $3 + 4$ STILL
EXIST!

WARNING:

THIS PROPERTY SHOWS YOU CANNOT TAKE A CLOSURE OF IT!