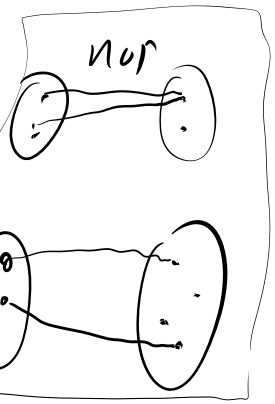
functions

domain

co-domain $\supseteq$ range

$f(x, y, z)$ domain $A \times B \times C$

A^3



x^2 $\pm\sqrt{x}$

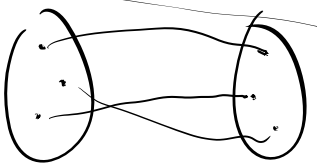
f f^{-1}

total

injective 1-to-1

surjective onto

bijection invertible correspondence



Relations

special type of func

Co-domain is $\{T, 1\}$

(predicate)

Total (bc inputs under as 1)

Surj (only two are not: $R(x,y,\ldots) = T$, $R(x,y,\ldots) = 1$)

¬ injective (bec $|\text{domain}| > 2$)

generalization of func

multiple values in co-dom for 1 val in domain

$f(x) = \pm\sqrt{x}$

$f(x) = x^2 + 3$

f(x)

y = x**x

ret y+3

$\{(0,3), (-1,4), \}$

$f(4) = \overset{2}{\text{or}}\ -2$

$\{(4,2), (4,-2) \ldots\}$

$R(x,y)$: $(x,y) \in S$

$S = \{(0,0), (4,2), (4,2) \ldots\}$

$R(x,y)$: $y^2 = x$

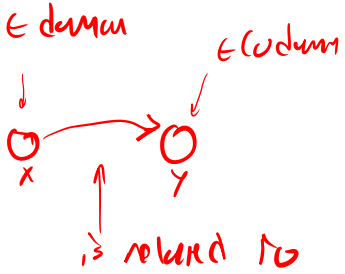
$S = \{(x,y) \mid R(x,y)\}$

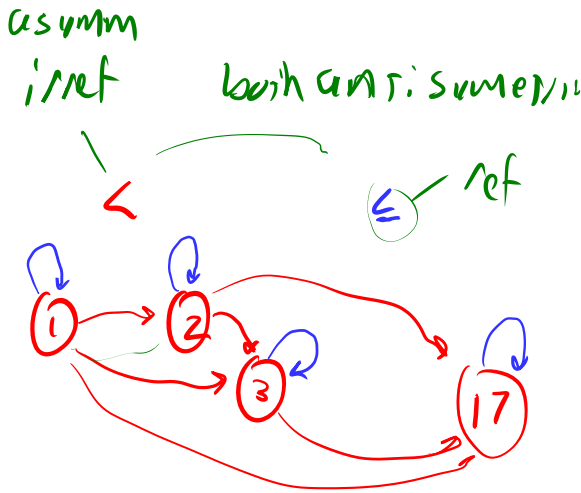
Binary Relation

$\forall x, y . \; R(x, y) \in \{\top, \bot\}$

$f(x) = y$

parent
cousin
boss
enemy
⋮

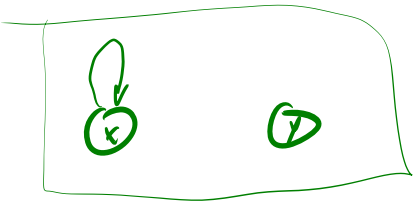




Symmetric

Transitive

Reflexive



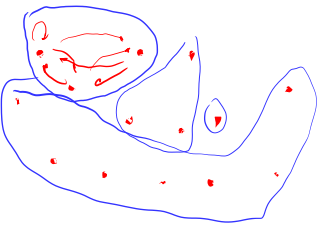
irrefexive

and asymmetric

anti symmetric

allow for anti, not for a

Partition
equiv class



$R(x,y)$ $x \in X$ $y \in Y$

	Symmetric	Transitive	reflexive	
$<$	a	partial order $a<b \wedge b<c \rightarrow a<c$ ✓	irref	order
$<=$	anti	partial order ✓	ref	order
$==$	$x==y \rightarrow y==x$ ✓	$x==y \wedge y==z \rightarrow x==z$ ✓	$x==x$ ✓	equivalence relation
$!=$	$x \neq y \rightarrow y \neq x$ ✓	$x \neq y \wedge y \neq z \not\rightarrow x \neq z$ ✗	ir	
Parent	anti	✗	ir	
boss	✗	?	✗	
sibling	✓	✓ (in-law sib ne)	✗	
citizen-of	✗	? ✗	✗	