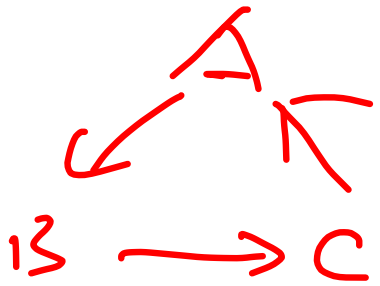
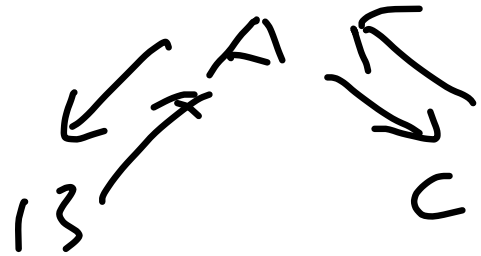
$A \to B$, $B \to A$, $B \to C$

~~$A \to C$~~ , $C \to A$

(1) $A \to B$, $B \to C$, $C \to A$



(2) first remove $B \to C$



1. F^{min} is not unique.

2. reduction steps:
   first (left reduction)
   then right reduction.

(1) $A \to C$

$A \to B$

$B \to A$

(2) $B \to C$

$A \to B$

$B \to A$

$A \to B$, $ABCD \to E$ ✓,
$EF \to G$, $EF \to H$,
~~$ACDF \to E$~~
~~$ACDF \to G$~~

① left reduction:

$AB \to C$

$B \to C$

$B \to C \models AB \to C$

$\dfrac{\begin{matrix} ACD \to E \\ EF \to G \end{matrix} \models ACDF \to G}{A \to B,\ ACD \to E,\ EF \to G,\ EF \to H}$

$F^{min} =$

keys: $ACDF$,
(AB), $(ACDE)$, (EFG)
(EFH), $(ACDF)$

Complexity:

* Deciding $\tilde{\tau}$ is in BCNF

$(X^+) = V$ for each $x \to A$ in $\tilde{\tau}$.

in PTIME.

* Deciding $\tilde{\tau}$ is in 3NF.

primality test:

Given $A \in V$, is A a KA?

is NP-complete.

R	X	Y	Z
1	2	3	
1	2	4	

ans(A, B) ←

R(A, B, C), 0

~~R(A, B, D).~~ (3)

ans(X) ← ~~R(X, X)~~, R(X, Y).

R	A	B
	1	1
	2	1

ans: 1
ans: 1

R ⋈ R:

A	B	C	D
1	2	3	3
1	2	3	4
1	2	4	3
1	2	4	4

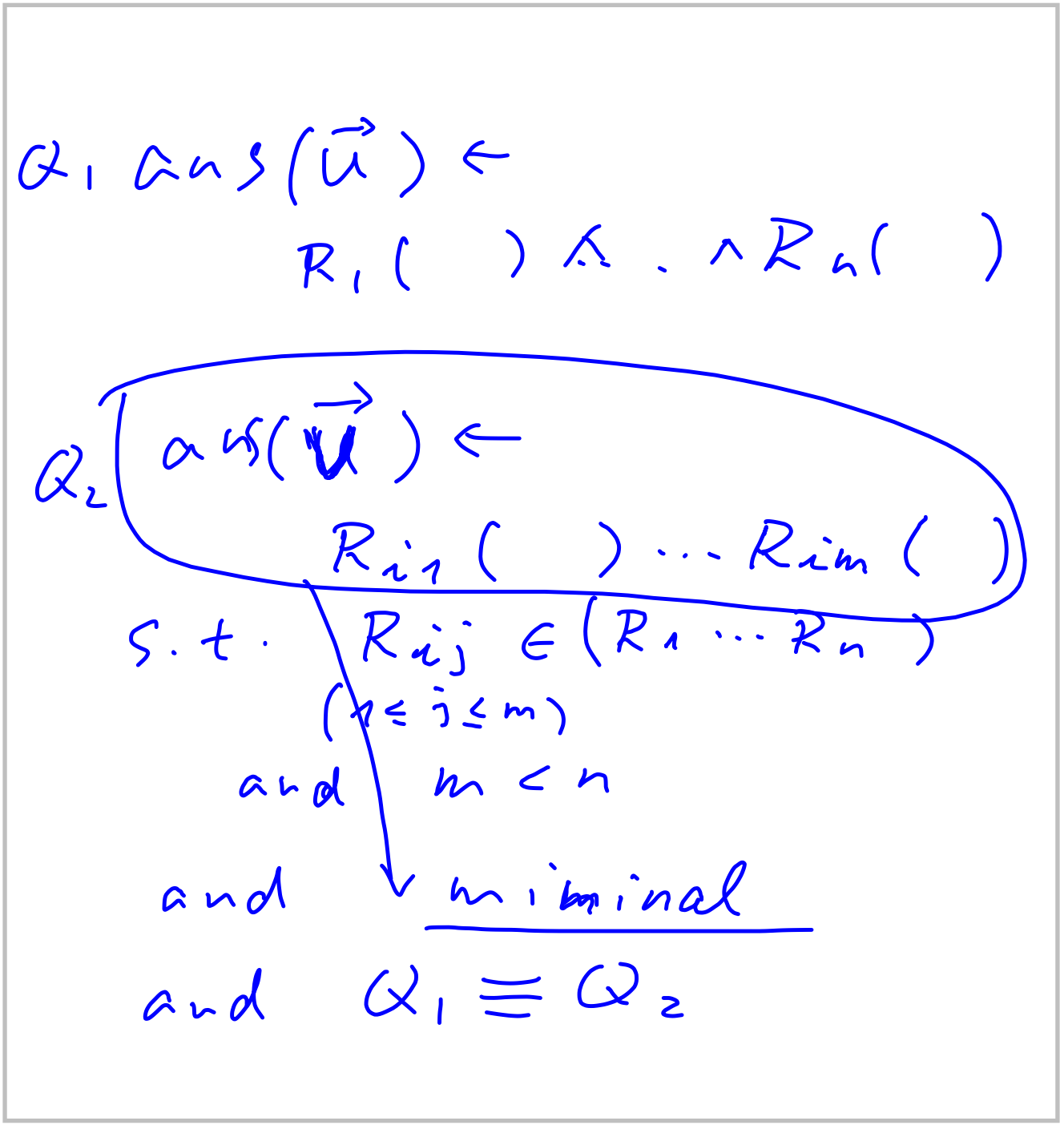
ans(X) ← R(X, Y)

ans: 1

ans: 1 2

wrong.

ans(X) ← R(X, X).


Q_1 ans$(\vec{u})$ ←
$R_1(\quad) \wedge \ldots \wedge R_n(\quad)$
Q_2
ans$(\vec{u})$ ←
$R_{i_1}(\quad) \cdots R_{i_m}(\quad)$
s.t. $R_{ij} \in (R_1 \cdots R_n)$
$(1 \le j \le m)$
and $m \le n$
and minimal
and $Q_1 \equiv Q_2$

$V = ABC$

$AB \to C$

$C \to A$ is a KA.

not in BCNF

keys: AB, CB.

but in 3NF.