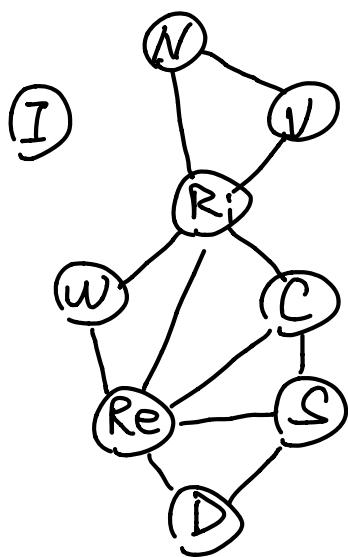


Problem 1 name: Bo Lin ID: 1001778270 netID: bxlf270

part a



Node I can be processed independently, and two subgraphs can be processed in parallel

part b

1. Unassigned variables [N, I, V, R_i, W, C, Re, S, D]

N: RV: 3 Deg: 2

I: RV: 3 Deg: 0 C: RV: 3 Deg: 3

V: RV: 3 Deg: 2 Re: RV: 3 Deg: 5

R_i: RV: 3 Deg: 5 S: RV: 3 Deg: 3

W: RV: 3 Deg: 2 D: RV: 3 Deg: 2

chosen variable: R_i

2. Unassigned variable [N, I, V, W, C, Re, S, D]

N: RV: 2 Deg: 1 C: RV: 2 Deg: 2

I: RV: 3 Deg: 0 Re: RV: 3 Deg: 4

V: RV: 2 Deg: 1 S: RV: 3 Deg: 3

W: RV: 2 Deg: 1 D: RV: 3 Deg: 2

chosen variable: Re

3. Unassigned variable [N, I, V, W, C, S, D]

N : RV: 2	Deg: 1	C : RV: 1	Deg: 1
I : RV: 3	Deg: 0	S : RV: 2	Deg: 2
V : RV: 2	Deg: 1	D : RV: 2	Deg: 1
W : RV: 1	Deg: 0		

chosen variable : W

4. Unassigned variable [N, I, V, C, S, D]

N : RV: 2	Deg: 1	C : RV: 1	Deg: 1
I : RV: 3	Deg: 0	S : RV: 2	Deg: 2
V : RV: 2	Deg: 1	D : RV: 2	Deg: 1

chosen variable : C

5 Unassigned variable [N, I, V, S, D]

N : RV: 2	Deg: 1	S : RV: 1	Deg: 1
I : RV: 3	Deg: 0	D : RV: 2	Deg: 1
V : RV: 2	Deg: 1		

chosen variable : S

6. Unassigned variable [N, I, V, D]

N : RV: 2	Deg: 1	V : RV: 2	Deg: 1
I : RV: 3	Deg: 0	D : RV: 1	Deg: 0

chosen variable : D

7. Unassigned variable [N, I, V]

N : RV: 2	Deg: 1	V : RV: 2	Deg: 1
I : RV: 3	Deg: 0		

chosen variable : N

8: unassigned variable [I, V]

I: RV: 3 Deg: 0 V: RV: 1 Deg: 0

chosen variable: V

9: Unassigned variable [I]

I: RV: 3 Deg: 0

chosen variable: I

part C

1. N: RGB I: RGB V: RGB R_i:RGB W: RGB

C: RGB R_e:RGB S: RGB D: RGB

chosen R_i = R

2. N: GB I: RGB V: GB W: GB C: GB

R_e: GB S: RGB D: RGB

chosen R_e = G

3: N: GB I: RGB V: GB W: B C: B

S: RB D: RB

chosen W = B

4: N: GB I: RGB V: GB C: B S: RB D: RB

chosen C = B

5: N: GB I: RGB V: GB S: R D: B

chosen S = R

6: N: GB I: RGB V: GB D: B

chosen D = B

7: $N: GB \quad I: RAB \quad V: aB$

chosen $N = G$

8: $I: RAB \quad V: B$

chosen : $V = B$

9: $I: RAB:$

chosen : $I = R$

part d:

$N: \text{Green} \quad I: \text{Red} \quad V: \text{Blue} \quad R_i: \text{Red} \quad W: \text{Blue}$

$C: \text{Blue} \quad R_e: \text{Green} \quad S: \text{Red} \quad D: \text{Blue}$

Problem 2:

function $\text{TT-ENTAILS?}(KB, \alpha)$ is for $KB \models \alpha$ by checking $KB \Rightarrow \alpha$. We want to check $KB_1 \Leftarrow KB_2$ so.

function $\text{CHECK-EQUIVALENCE}(KB_1, KB_2)$ returns true or false

inputs: KB_1 : the knowledge base.

KB_2 : the knowledge base.

for α in KB_1 :

if $\text{TT-ENTAILS}(KB_2, \alpha)$:

for β in KB_2 :

if $\text{TT-ENTAILS}(KB_1, \beta)$: returns true

else return false

else return false

Problem 3

A	B	C	KB	S_1	$\neg KB$	$\neg S_1$
T	T	T	T	T	F	F
T	T	F	F	T	T	F
T	F	T	F	T	F	F
T	F	F	F	T	T	F
F	T	T	F	F	T	T
F	T	F	F	F	T	T
F	F	T	F	T	F	F
F	F	F	F	F	T	T

part a:

For all KB is true, S_1 should be true

so $KB \models S_1$

part b:

For all $\neg KB$ is true, $\neg S_1$ should be true

so $\neg KB \not\models \neg S_1$

Problem 4

$$\begin{aligned} & \neg(A \wedge B \wedge \neg C \wedge D) \wedge \neg(A \wedge \neg B \wedge C \wedge \neg D) \\ & (\neg A \vee \neg B \vee \neg(\neg C) \vee \neg D) \wedge (\neg A \vee \\ & \quad \neg(\neg B) \vee \neg C \vee \neg(\neg D)) \\ & (\neg A \vee \neg B \vee C \vee \neg D) \wedge (\neg A \vee B \vee \neg C \\ & \quad \vee D) \end{aligned}$$

so :

$$(\neg A \vee \neg B \vee C \vee \neg D) \wedge (\neg A \vee B \vee \neg C \vee D)$$

is CNF

Problem 5

$$A \Leftrightarrow B$$

$$B \Rightarrow C$$

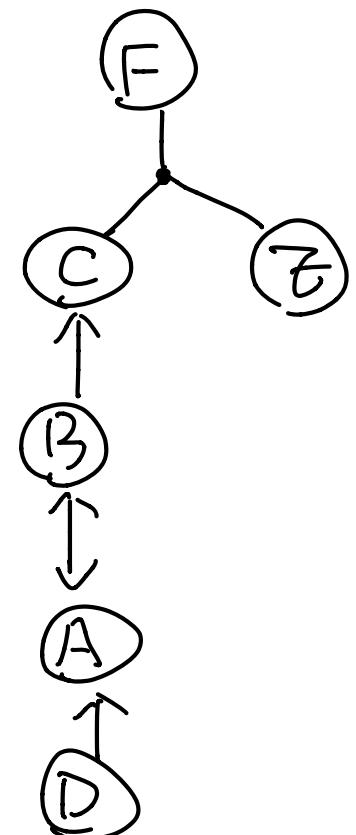
$$D \Rightarrow A$$

$$C \text{ AND } \neg C \Rightarrow F$$

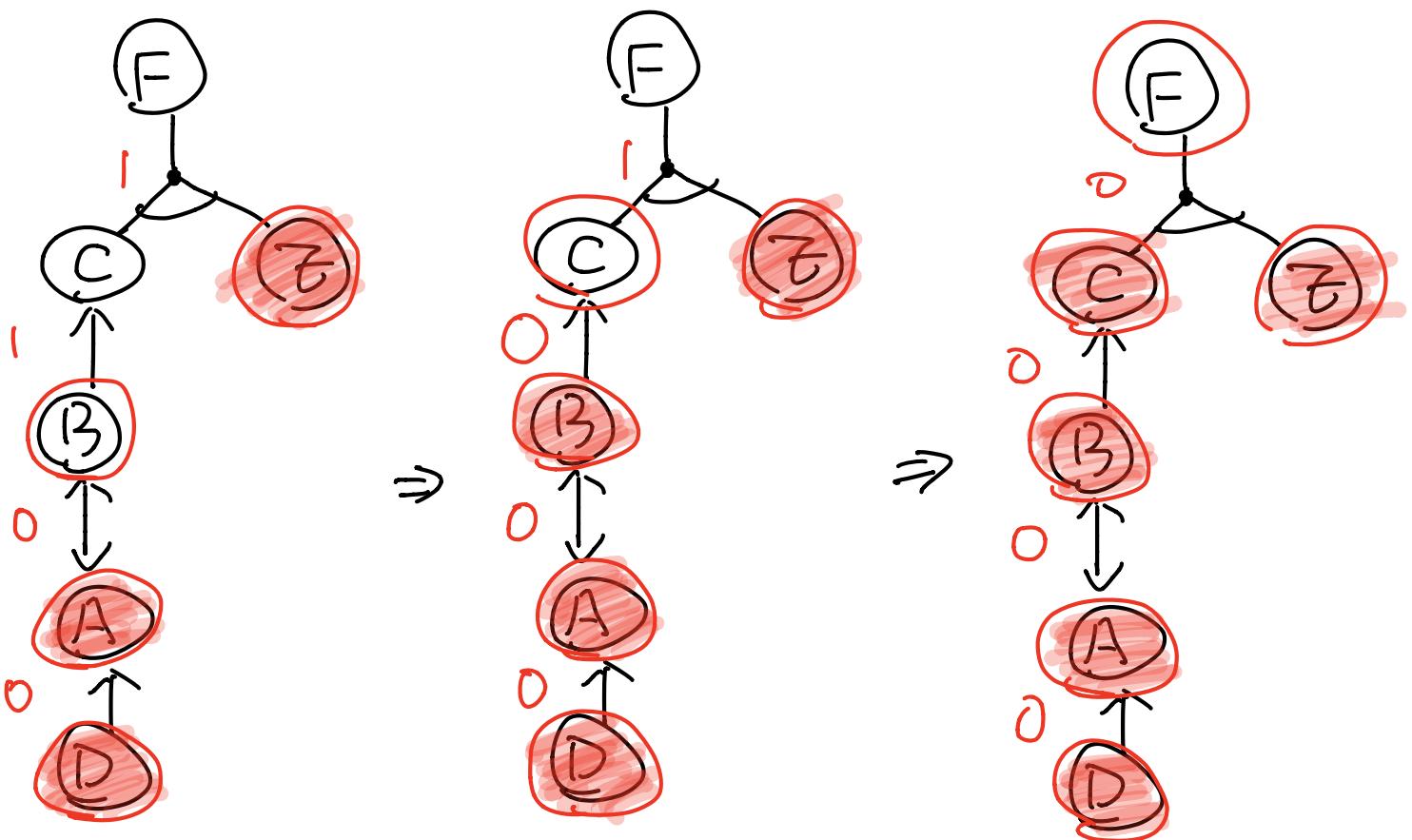
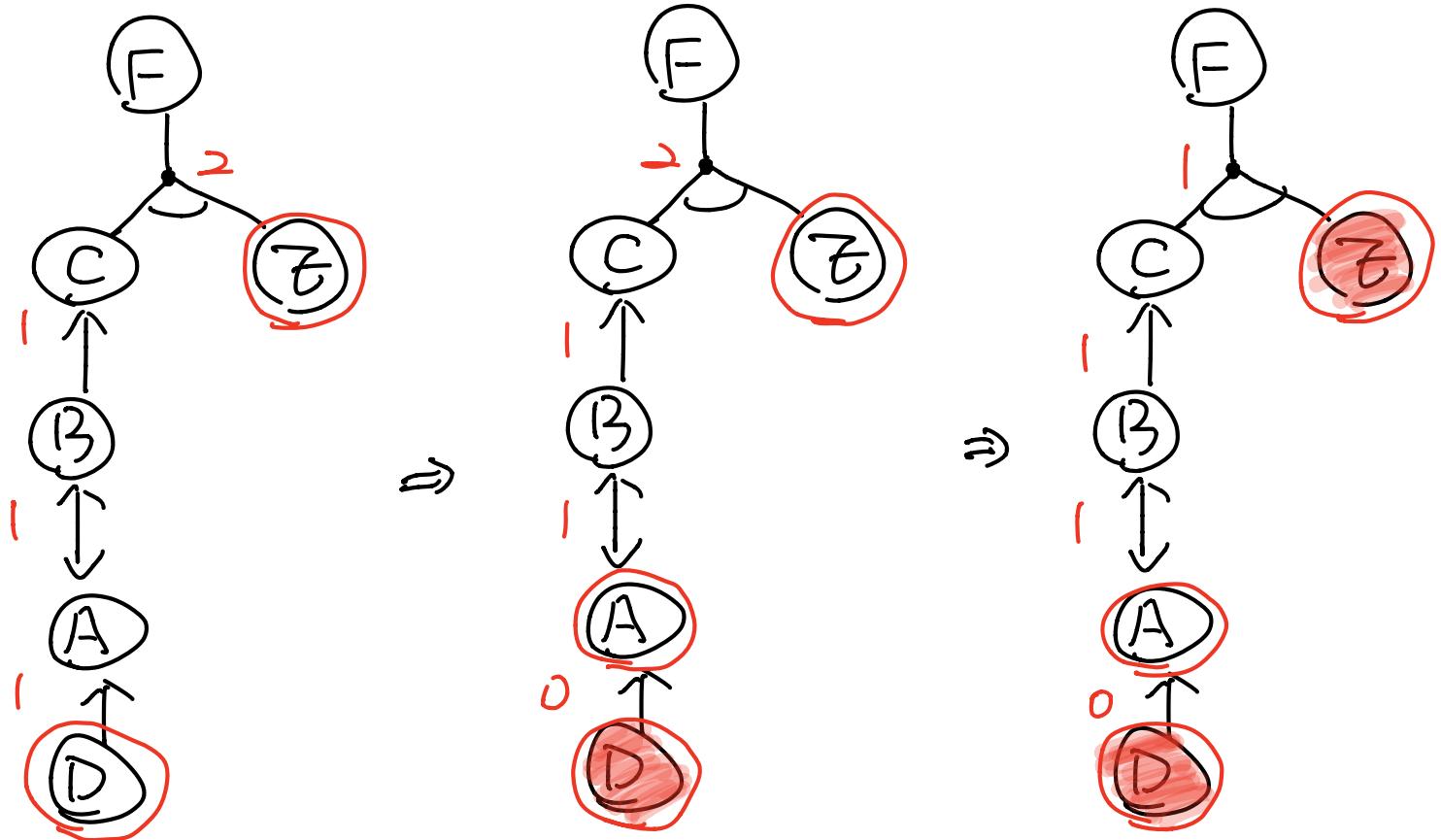
$$\neg B$$

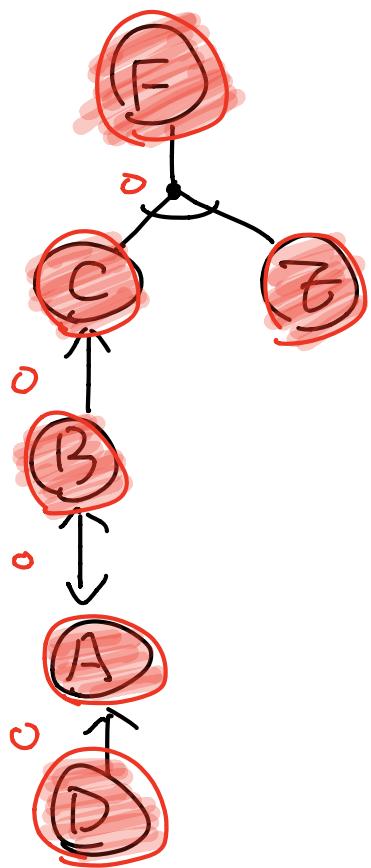
$$D$$

$$\left\{ \begin{array}{l} A \Rightarrow B \\ B \Rightarrow A \\ D \Rightarrow A \\ C \wedge \neg C \Rightarrow F \\ \neg B \\ D \end{array} \right. \xrightarrow{\text{horn form}}$$

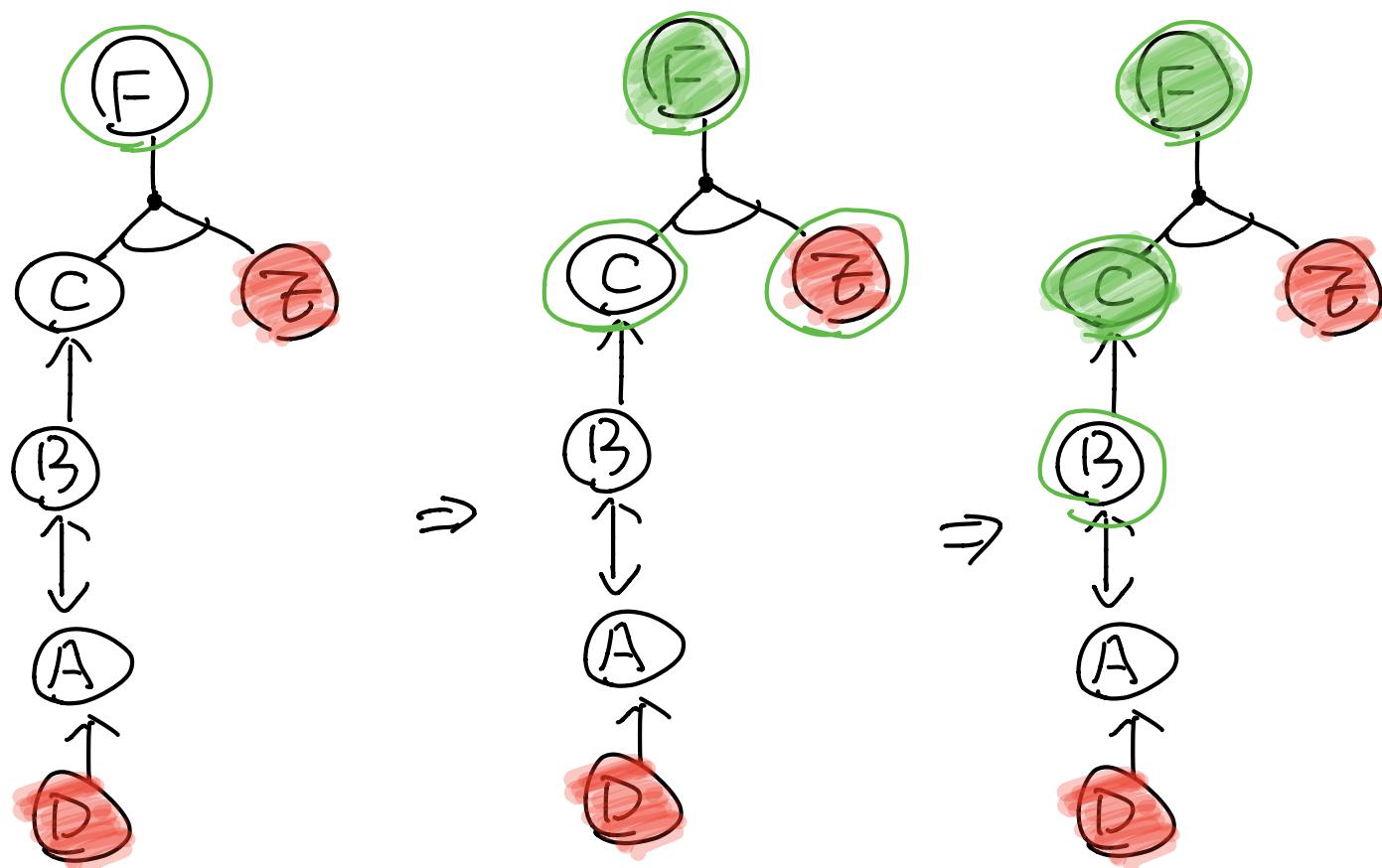


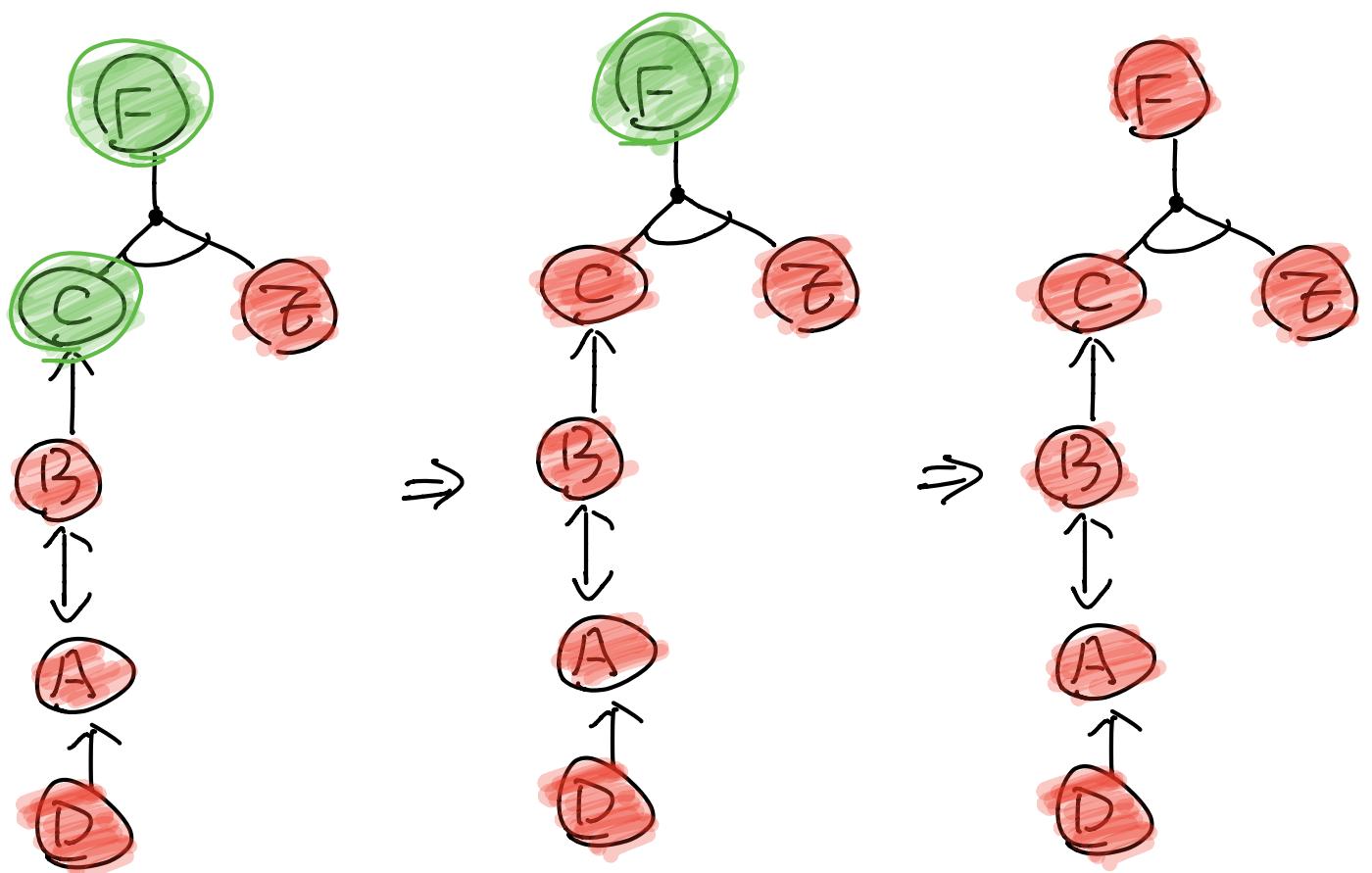
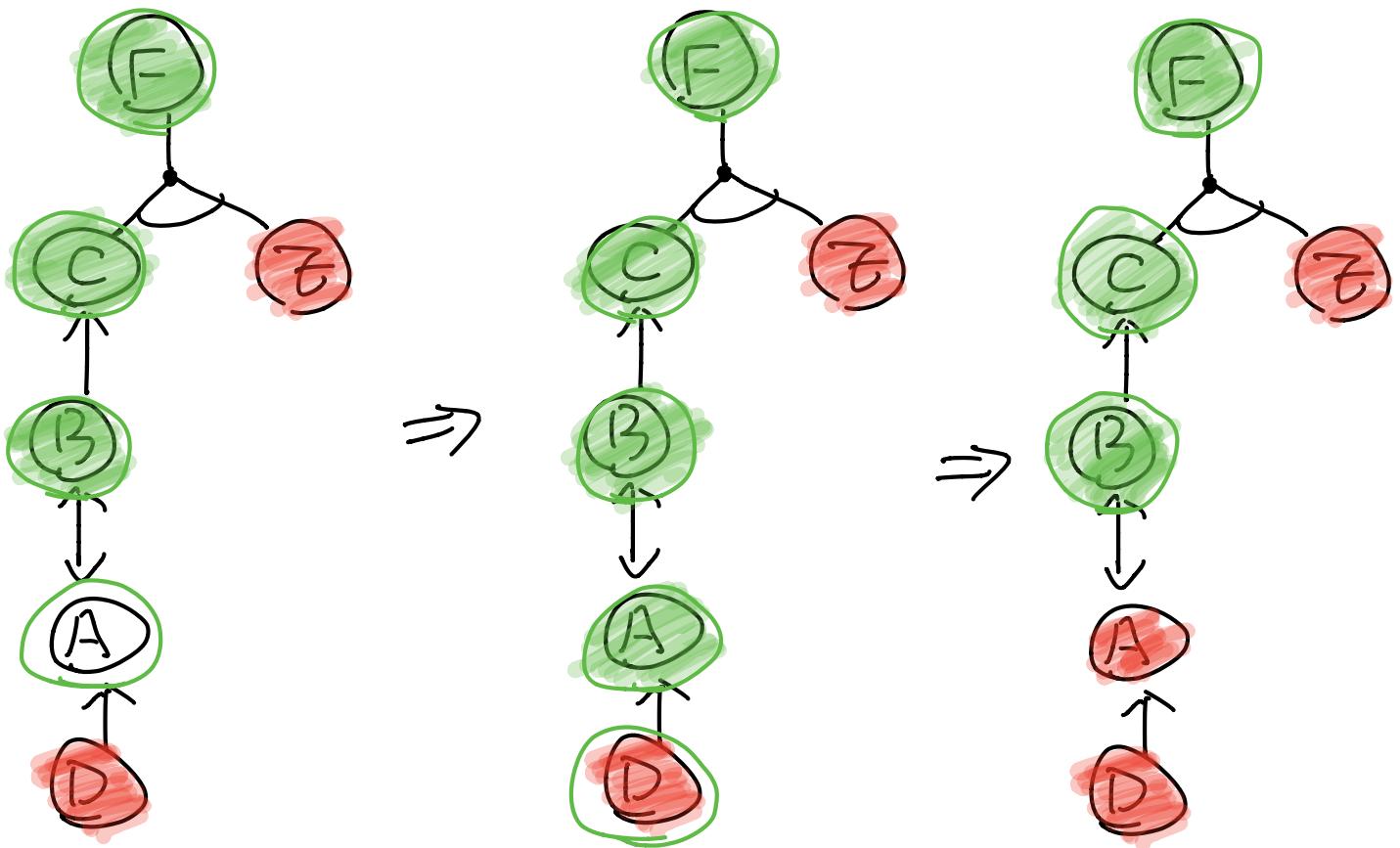
i, forward chaining





ii backward chaining





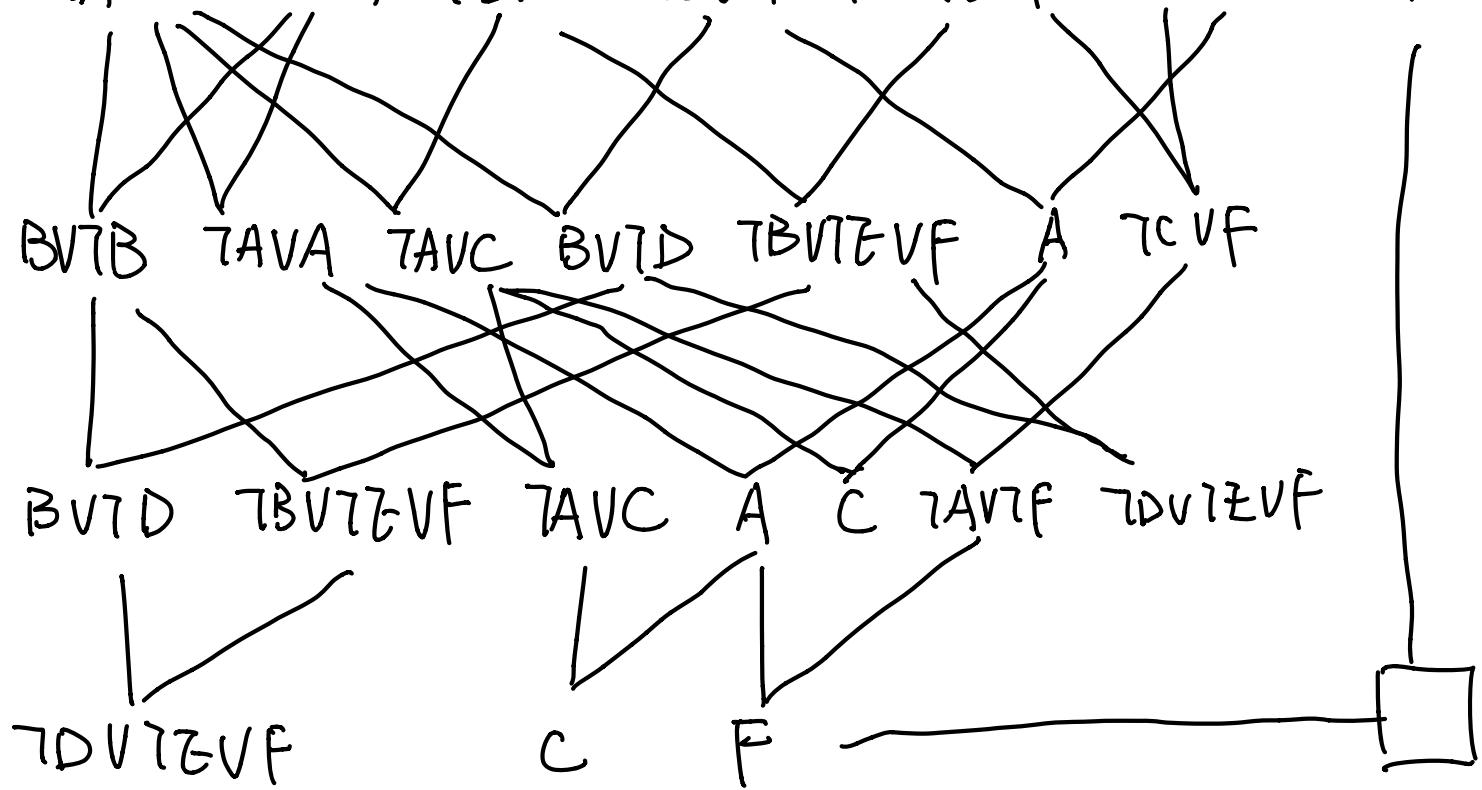
iii resolution.

$$A \Rightarrow B \quad B \Rightarrow A \quad B \Rightarrow C \quad D \Rightarrow A \quad C \wedge E \Rightarrow F \quad E \quad D$$

TAVB TBVA TBVC TDVA T(CAE)VF E D

TAVB TBVA TBVC TDVA TCVTZVF Z D

TAVB TBVA TBVC TDVA TCVTEVF E. D. TF



Problem 6

part a : FOL

date : May 1, 2017 , May 2, 2017 , May 3, 2017
 (d_1) (d_2) (d_3)

person : John (j) , Mary (m)

rain (d) : if it rain on date d, it is true
else. it is false

give (p_1, p_2, d) : if person p_1 gives person p_2 a check for
\$10000 on date d, it is true else false

mow (p, d) : if person p mows the lawn on
May 3, 2017 it is true else false

$\text{rain}(d_1) \Rightarrow \text{give}(j, m, d_2) \Rightarrow \text{mow}(m, d_3)$

part b : logical statement

$\text{Train}(d_1) \wedge \text{give}(j, m, d_2) \wedge \text{mow}(m, d_3)$

part c:

Symbol

R: It is rains on May 1, 2017

J: John gives Mary a check for \$10000 on May 2, 2017

M: Mary mows the lawn on May 3, 2017

a: $R \wedge J \wedge M$

$R \wedge J \wedge M \Rightarrow GJM$

b: $\neg R \wedge J \wedge M$

$\neg R \wedge J \wedge M \Rightarrow NM$

part d:

Truly happened: R: False J: True M: True

None of the statements in contract is false

So the contract is not violated.

use symbol to justify

Problem 7

$\text{faller}(\text{John}, y) \quad \text{faller}(x, \text{Son}(x))$

$\Rightarrow \{ x/\text{John}, y/\text{Son}(\text{John}) \}$

$\text{taller}(y, \text{Barry}) \quad \text{taller}(\text{Barry}, x)$

$\Rightarrow \{ x/\text{Barry}, y/\text{Barry} \}$

$\text{taller}(x, \text{Jane}) \quad \text{faller}(\text{Bob}, \text{Jane})$

$\Rightarrow \{ x/\text{Bob} \}$

$\text{faller}(\text{Son}(x), \text{Jane}) \quad \text{faller}(\text{Bob}, \text{Jane})$

$\Rightarrow \text{fail}$

$\text{faller}(\text{Barry}, \text{John}) \quad \text{faller}(x, y)$

$\Rightarrow \{ x/\text{Barry}, y/\text{John} \}$