CMSC-471 assignment 3

Part 1

1. $A \wedge B \models B$

A	B	A∧B
T	F	F
T	T	T
F	F	F
F	T	F

True, A∧B gives True then B is true

2. $A \vee B \not\models A$

A	B	A∨B
T	F	T
T	T	T
F	F	F
F	T	T

false b/c if A is false, B is true, then A∨B gives T

3) $\neg A \models \neg\neg A$

A	¬A	¬¬A
T	F	T
F	T	F
T	F	T
F	T	F

False $\neg A \not\models \neg\neg A$

if $\neg A = T$ then $\neg\neg A = F$

4) $\neg A \models A \Rightarrow B$

A	B	¬A	A→B
T	F	F	F
T	T	F	T
F	F	T	T
F	T	T	T

True

5) $A \wedge (A \rightarrow B) \models B$

A	B	A→B	A∧(A→B)
T	F	F	F
T	T	T	T
F	F	T	F
F	T	T	F

True

Part 2

1) $\forall x\,(\text{bitter}(x) \vee \text{sweet}(x))$

2) $\forall x\,(\text{bitter}(x)) \vee \forall x\,(\text{sweet}(x))$

3) $\text{likes}(x,y)$, $\text{mary}(x)$

$\forall x\,[\neg \text{mary}(x) \wedge \text{likes}(x, \text{mary})]$

4) $\exists x[\text{person}(x) \wedge \text{like}(x, \text{mary})]$

5) $\exists x[\text{person}(x) \wedge \neg(x = \text{mary}) \wedge \text{lik}(x, \text{mary})]$

6) $\forall x\,(\text{do\_it}(x) \rightarrow \text{do\_it}(\text{jones}))$

or

$(\exists x\ \text{do\_it}(x)) \rightarrow \text{do\_it}(\text{jones})$

7) $\text{do\_it}(\text{jones}) \rightarrow \forall x\ \text{do\_it}(x)$

8) raining(k)

out(Roger) ↔ ¬raining

9) $\forall xyz[[ancestor(x,y) \wedge ancestor(y,z)] \Rightarrow ancestor(x,z)]$

10) $\neg(\exists x\, number(x) \wedge natural(x) \wedge (\forall y\, number(y) \wedge natural(y) \rightarrow y \leq x))$

Part 3

- If you eat ice cream and you get sick then you are lactose intolerant
- you eat ice cream
- you get sick

1) $(icecream \wedge sick) \rightarrow lactoseIntolerant\ (LI)$

2) KB: $[icecream \wedge sick \rightarrow LI,\ icecream,\ sick]$

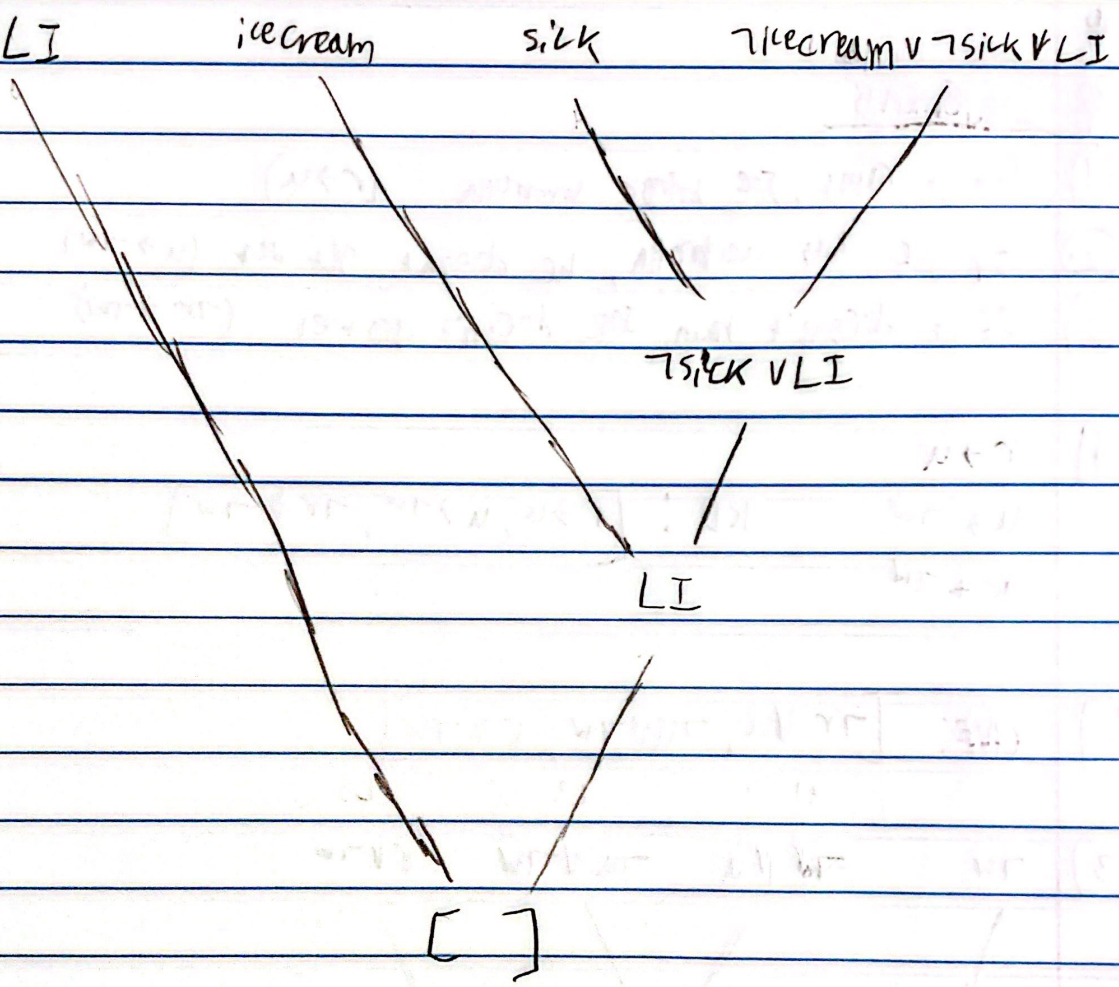
↓

$\neg(icecream \wedge sick) \vee LI$

↓

CNF: $[\neg icecream \vee \neg sick \vee LI,\ icecream,\ sick]$

3)



3.2

Statements

1. If it rains, Joe brings umbrella $(r \to u)$
2. If Joe has umbrella, he doesn't get wet $(u \to \neg w)$
3. If it doesn't rain, Joe doesn't get wet $(\neg r \to \neg w)$

1) $r \to u$

$u \to \neg w$

$\neg r \to \neg w$

KB : $[r \to u, u \to \neg w, \neg r \to \neg w]$

2) CNF: $[\neg r \vee u, \neg u \vee \neg w, r \vee \neg w]$

L1 L2 L3

3) $\neg w$ $\neg r \vee u$ $\neg u \vee \neg w$ $r \vee \neg w$