Song Han

4.(a)

$KB = \{(A \vee B) \rightarrow C, A\}$

$= \{\neg(A \vee B) \vee C, A\}$

$= \{(\neg A \wedge \neg B) \vee C, A\}$

$= \{(\neg A \vee C) \wedge (\neg B \vee C), A\}$ — CNF form

The above CNF is equivalent to:

$KB = \{\neg A \vee C, \neg B \vee C, A\}$

$= \{A \rightarrow C, B \rightarrow C, A\}$

Thus $\dfrac{A \rightarrow C, A}{C}$

4(b) $KB = \{A \vee B, B \rightarrow C, (A \vee C) \rightarrow D\}$

Convert to CNF: $= \{A \vee B, \neg B \vee C, \neg(A \vee C) \vee D\}$

$= \{A \vee B, \neg B \vee C, (\neg A \wedge \neg C) \vee D\}$

$= \{A \vee B, \neg B \vee C, (\neg A \vee D) \wedge (\neg C \vee D)\}$

$= \{A \vee B, \neg B \vee C, \neg A \vee D, \neg C \vee D\}$

Apply resolution rule: $\dfrac{A \vee B, \neg B \vee C, \neg A \vee D, \neg C \vee D}{A \vee C, \neg A \vee D, \neg C \vee D}$

$$\frac{A \vee C,\ \neg A \vee D,\ \neg C \vee D}{A \vee D,\ \neg A \vee D}$$

$$\frac{A \vee D,\ \neg A \vee D}{D}$$

So we derived D by applying resolution rule repeatly

5.(b)

For a finite number of numbers, in order to satisfy (1) every number x has to have a unique succer. and (5) the succer of x is larger than x, those numbers will form a ring with the 'greater than' relationship. According to the transitive property, "if $x > y$ and $y > z$, then $x > z$" then there will be a number greater than ieself with in this ring structure. This is not consistent with the 7th condition "A number is not larger than ieself"