7.2

Unicorn is mythical or not mythical, in other words, it's immortal or mammal. Because either the unicorn is immortal or a mammal, it's horned. So the unicorn is horned, then it's magical.

From the description, we have four logic relationships below:

1. $Mythical \Rightarrow Immortal$
2. $\neg Mythical \Rightarrow Mammal$
3. $Immortal \lor Mammal \Rightarrow Horned$
4. $Horned \Rightarrow Magical$

From 1 and 2, we get

5. $(Mythical \Rightarrow Immortal) \lor (\neg Mythical \Rightarrow Mammal)$

$$(\neg Mythical \lor Immortal) \lor (Mythical \lor Mammal)$$
$$\neg Mythical \lor Immortal \lor Mythical \lor Mammal$$
$$Immortal \lor Mammal$$

Form 5 and 3, we can know Unicorn is Horned

Form 5, 3, and 4, we can get Unicorn is Magical.

But we can't know whether Unicorn is mythical or not.

7.18

a).

Food	Drink	Party	$(Food \Rightarrow Party) \lor (Drink \Rightarrow Party)$	$(Food \land Drink) \Rightarrow Party$
true	true	true	true	true
true	true	false	false	false
true	false	true	true	true
true	false	false	true	true
false	true	true	true	true
false	true	false	true	true
false	false	true	true	true
false	false	false	true	true

From this table, $[(Food \Rightarrow Party) \lor (Drink \Rightarrow Party)] \Rightarrow [(Food \land Drink) \Rightarrow Party]$ is always true, so this sentence is valid.

b).

Left side:

$(Food \Rightarrow Party) \lor (Drink \Rightarrow Party) \rightarrow (\neg Food \lor Party) \lor (\neg Drink \lor Party) \rightarrow$
$(\neg Food \lor Party \lor \neg Drink \lor Party) \rightarrow (\neg Food \lor \neg Drink \lor Party)$

Right side:

$(Food \land Drink) \Rightarrow Party \rightarrow \neg(Food \land Drink) \lor Party \rightarrow (\neg Food \lor \neg Drink) \lor Party \rightarrow$
$(\neg Food \lor \neg Drink \lor Party)$

Both sides have the same CNF form, or we can say left side equals to right side, hence the sentence is valid.

c).

Solution by resolution as follows:

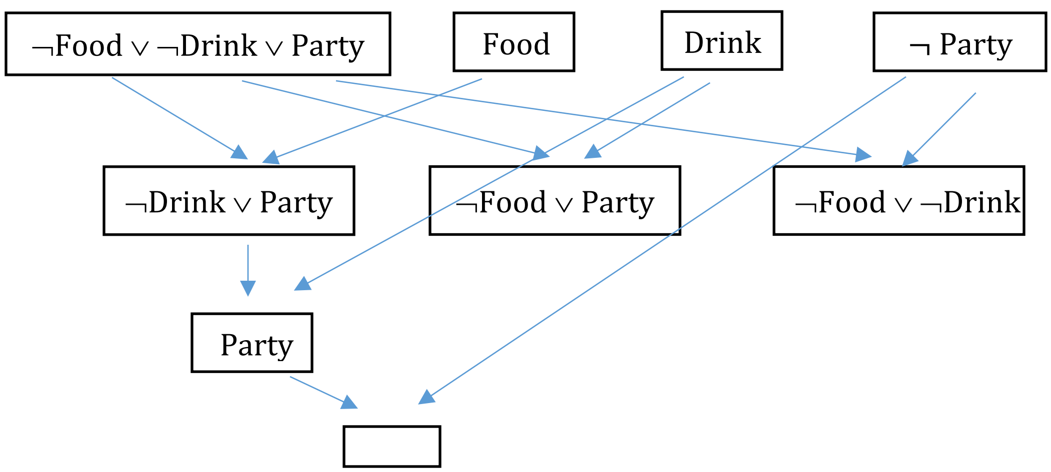
Proof by contradiction with $KB \land \neg\alpha$, with:

$KB = (\text{Food} \Longrightarrow \text{Party}) \lor (\text{Drink} \Longrightarrow \text{Party})$

$\alpha = (\text{Food} \land \text{Drink}) \Longrightarrow \text{Party}$.

Get CNF of $KB \land \neg\alpha$:

$$
\begin{aligned}
& KB \land \neg\alpha \\
\Leftrightarrow\quad & (\text{Food} \Longrightarrow \text{Party}) \lor (\text{Drink} \Longrightarrow \text{Party}) \land \neg\,[(\text{Food} \land \text{Drink}) \Longrightarrow \text{Party}] \\
\Leftrightarrow\quad & (\neg\text{Food} \lor \text{Party}) \lor (\neg\text{Drink} \lor \text{Party}) \land \neg\,[\neg(\text{Food} \land \text{Drink}) \lor \text{Party}] \\
\Leftrightarrow\quad & (\neg\text{Food} \lor \neg\text{Drink} \lor \text{Party}) \land \neg(\neg\text{Food} \lor \neg\text{Drink} \lor \text{Party}) \\
\Leftrightarrow\quad & (\neg\text{Food} \lor \neg\text{Drink} \lor \text{Party}) \land \text{Food} \land \text{Drink} \land \neg\text{Party}
\end{aligned}
$$



Two clauses resolve to derive the empty clause, hence KB does entail α.