Q5) Let,

b → wears blue hat

g → wears green hat

y → wears yellow sweater

t → wears tie

w → wears bow tie

s → wears socks

~~w → wears bow tie~~

a) Assuming tie + bow tie ~~can be~~ are different ~~the same thing~~,

① ⇒ $(g \wedge \neg s) \vee (\neg g \wedge s)$

② ⇒ $(g \wedge y) \rightarrow \neg t$

③ ⇒ $g \wedge [(y \wedge \neg s) \vee (\neg y \wedge s)]$

④ ⇒ $s \rightarrow y$

⑤ ⇒ w

Deduction:-

Assuming Ross has a same sense of fashion and does not wear tie + bow tie together since ⑤ is true, we can deduce that yesterday he did not wear a tie.

From ⑤ & ② We can say that,

t = false,

$\neg t$ = true, so,

$(g \wedge y)$ = true

⑥ g = true, y = true

From (6) and (3) we can say that, since ross was wearing a y and g, he cannot be wearing a sock. i.e $\neg s$ = true

$s$ = false.

Thus, yesterday Ross's attire can be deduced as,

$$g \wedge y \wedge w \wedge \neg t \wedge \neg s \wedge \neg b$$

green hat, yellow sweater, bow tie, with no socks.

b) ~~Simplifi~~ Simplifying :-

$$\left[(g \wedge \neg s) \vee (\neg g \wedge s)\right] \wedge \left[\neg(g \wedge y) \vee \neg t\right]$$

$$\wedge \left[g \wedge \left[(y \wedge \neg s) \vee (\neg y \wedge \neg s)\right]\right] \wedge (\neg s \vee y) \wedge \neg t$$