

16.3 (1) convert the following to clause form:

$$((\exists x)(p(x) \vee (\exists x)(q(x) \wedge (\neg(\exists x)(p(x) \vee q(x))))))$$

Soln

$$\neg((\exists x)(p(x) \vee (\exists x)(q(x) \wedge (\neg(\exists x)(p(x) \vee q(x))))))$$

$$\neg(\exists x)(p(x) \vee (\exists x)(q(x) \wedge (\neg(\exists x)(p(x) \vee q(x))))$$

$$(\forall x)(\neg p(x) \wedge (\forall y)(\neg q(y) \vee (\exists z)(p(z) \vee q(z))))$$

// can take out  $\forall x$   
// assign diff variable

Skolem function

$$(\forall x)(\exists y)(p(x, y))$$

$$\downarrow h(x)$$

$$\rightarrow (\forall x)(p(x, h(x)))$$

$$\neg(\neg p(x)) \wedge (\neg(\neg q(y)) \vee p(sk) \vee q(sk))$$

function

$$\neg p(x) \wedge \neg q(y) \vee (p(sk) \vee q(sk))$$

Need to finish

16.4

① member (Mike, Alpine) // Mike member of Alpine club

② member (Tony, Alpine)

③ member (John, Alpine)

// For every member in Alpine club, either in ski or mountain climbing

$$(\forall x) \text{member}(x, \text{Alpine}) \supset [\text{Skier}(x) \vee \text{MC}(x)]$$

$$\neg(\exists x) [MC(x) \wedge \neg \text{Likes}(x, \text{rain})]$$

$$(\forall x) [\text{Skier}(x) \supset \text{Likes}(x, \text{snow})]$$

$$(\forall x) [\text{Likes}(\text{Tony}, x) \supset \neg \text{Likes}(\text{Mike}, x)]$$

$$(\forall x) [\neg \text{Likes}(\text{Tony}, x) \supset \text{Likes}(\text{Mike}, x)]$$

$$\text{Likes}(\text{Tony}, \text{rain}) \wedge \neg \text{Likes}(\text{Tony}, \text{snow})$$

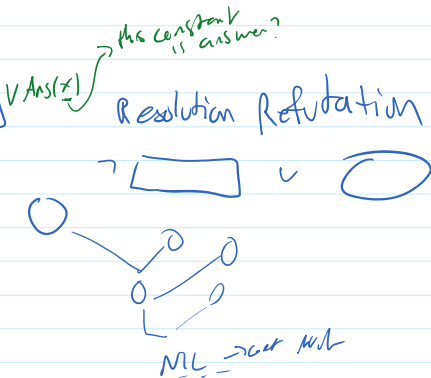
$$(1) \neg \text{Member}(x, \text{Alpine}) \vee \text{Skier}(x) \vee \text{MC}(x)$$

$$(5) \neg \text{MC}(x) \vee \neg \text{Likes}(x, \text{rain})$$

$$(6) \neg \text{Skier}(x) \vee \text{Likes}(x, \text{snow})$$

prove?

pf: 



- $(6) \neg \text{Skier}(x) \vee \text{Likes}(x, \text{snow})$   
 $(7) \neg \text{Likes}(\text{Tony}, x) \vee \neg \text{Likes}(\text{Mike}, x)$   
 $(8) \text{Likes}(\text{Tony}, x) \vee \text{Likes}(\text{Mike}, x)$

$(11) (\exists x) [\text{Member}(x, \text{Alp}) \wedge MC(x) \wedge \neg \text{Skier}(x)]$   
 $\Rightarrow \neg \text{Memb}(x, \text{Alp}) \vee \neg MC(x) \vee \text{Skier}(x) \vee \underline{\text{Ans}(x)}$

$(12) : (11) + (4)$

$\neg \text{Memb}(x, \text{Alp}) \vee \text{Skier}(x) \vee \text{Ans}(x)$

$(13) : (12) + (10)$  // can do 1, 2 or 3  
// assign x to Mike / Tony / Jack  
 $\text{Skier}(\text{Mike}) \vee \text{Ans}(\text{Mike})$

$(14) : (13) + (6)$  //  $x = \text{Mike}$   
 $\text{Likes}(\text{Mike}, \text{snow}) \vee \text{Ans}(\text{Mike})$

$(15) : (14) + (7)$   
 $\neg \text{Likes}(\text{Tony}, \text{snow}) \vee \text{Ans}(\text{Mike})$

$(16) : (15) + (10)$   
 $\text{Ans}(\text{Mike})$