

Discrete Math. Hw. 3.

Ex 6, 18, 28, page 92

⑥ "If it does not rain or if it is not foggy, then the sailing race will be held and the life saving demo will go on".

"If the sailing race is held, then the trophy will be awarded".

"The trophy was not awarded".

"Sailing race will be held" = a	$(\neg b \vee \neg c) \rightarrow a$
"It rains" = b	$a \rightarrow d$
"It's foggy" = c	$\neg d$
"Trophy is awarded" = d	$\Rightarrow b$

$(\neg d \wedge (a \rightarrow d)) \rightarrow \neg a$  Modus Tollens

$(\neg a \wedge ((\neg b \vee \neg c) \rightarrow a)) \rightarrow$  Modus Tollens

$\neg(\neg b \vee \neg c)$

$\neg(\neg b \vee \neg c) \Rightarrow (b \wedge c)$  De Morgan Law  $\Rightarrow$

$\therefore$  QED

$b \equiv$  It rains

$c \equiv$  It's foggy

## Discrete Math

(19)  $S(x, y)$  with  $x < y$  is a predicate. with 2 different variables, this means that the value of  $x$  must be different than the  $y$  value.

$\exists x S(x, \text{Max}) \rightarrow$  (I don't know if "Max" actually means Maximum value of any specific group).

This should be the  $x$ .

We understand this element as a variable.  $y$ .

~~the  $x$  or  $y$~~

But the part:

$S(\text{Max}, \text{Max})$  is not representing  $S(x, y)$ , but another predicate we haven't defined yet.

Therefore.  $S(x, x)$  cannot be wrong because we don't know what does  $S(x, x)$  "state".

(29)  $\forall x (P(x) \vee Q(x)) \wedge \forall x ((\neg P(x) \wedge Q(x)) \Rightarrow R(x))$  Premises

$(P(c) \vee Q(c)) \wedge ((\neg P(c) \wedge Q(c)) \Rightarrow R(c))$  Universal instantiation.

$(P(c) \vee Q(c)) \wedge (\neg(\neg P(c) \wedge Q(c)) \vee R(c))$  Condition - Disj. equivalence.

$(P(c) \vee Q(c)) \wedge (P(c) \vee \neg Q(c) \vee R(c))$   $[A \wedge \neg A \equiv 0]$

~~$P(c) \vee Q(c) \wedge (P(c) \vee \neg Q(c) \vee R(c))$~~   $\rightarrow$  Negation law, And De Morgan's law.

$(P(c) \vee R(c))$

$(\neg R(c) \Rightarrow P(c))$  Condition - Disjunction equivalence.

$\forall x (\neg R(x) \Rightarrow P(x))$   $\therefore$  Q.E.D.

Universal Generalization.

