Lecture 6

- HW2 Fri 11:59 pm.

Equivilent things:

$P \to Q$	If P then Q
$\neg P \vee Q$	P implies Q.
$\neg(P \wedge \neg Q)$	P only if Q.
$\neg Q \to \neg P$.	Q if P
(contrapositive).	P is a sufficient condition for Q.
	Q is a necessary condition for P.

Converse - if $P \to Q$ is true. (false)

if $Q \to P$. not equivielent. (opposite truth value).

e.g.

if x is an interger, then 2x is an interger.

A ... V.

$A \to V$ (T) $V \to A$ (F).

Biconditional:

$P \leftrightarrow Q \equiv (P \to Q) \wedge (Q \to P)$. P if and only if Q.

P	Q	$P \to Q$	$Q \to P$	$P \leftrightarrow Q$.
F	F	T	T	T
F	T	T	F	F
T	F	F	T	F
T	T	T	T.	T.

e.g. you attend the lecture (P).

you singned up for the lecture (Q).

$P \to Q$ T $\quad Q \to P$ T $\quad P \leftrightarrow Q$ T.

F $\quad$ F

In English equivalent things:

$P \Leftrightarrow Q$.

P iff Q.

P is a necessary and sufficient for Q.

$Q \to P$. $\quad P \to Q$.

Interval

a, b are two real numbers.

$(a, b) = \{x \mid a < x < b\}$. open interval.

$[a, b) = \{x \mid a \leq x < b\}$. half-opened interval.

$[a, b] = \{x \mid a \leq x \leq b\}$ closed interval

Chapter 2: Quantification Logic.

(predicate logic).

§ 2.1. Quantifiers:

$\forall$ all

$\exists$ exist.

e.g. $\forall x\ P(x) \Rightarrow$ for all x, $P(x)$ is true.

$\exists x\ P(x)$ exist x that ....

universe of discore U

$\forall x\ P(x) \Leftrightarrow \{x \mid P(x)\} = U$.

$\exists x \; P(x) \iff \{x \mid P(x)\} \neq \emptyset$ at least one x satisified

e.g. $U = \mathbb{N}$.

$\forall n \; (n+2 \geq 0)$ T. $\qquad \exists n \; (n+2 \geq 0)$ T

$\forall n \; (n-2 \leq 0)$ F. $\qquad \exists n \; (n-2 \geq 0)$ T.

$\exists n \; n^2 = m$?

bound variable $\qquad$ free variable.

Translate logics into English.

Nobody is perfect.

$P(x)$ someone is perfect.

$\Rightarrow \begin{cases} \forall x \; \neg P(x). \\ \neg \exists x \; P(x). \end{cases}$