§1.2. Propositions 명제

A proposition is a sentence that is either true or false, but not both.

ex) $1+1=2$ (O)
$1+2=4$ (O)
$x+3>2$ proposition(X)

Earth is the only planet in the universe that contains life.

There are infinitely many primes.
2, 3, 5, 7, 11, 13, ...
There are infinitely many twin primes.
(3,5), (5,7), (11,13), (17,19),
...
Twin prime conjecture. 쌍둥이 소수 추측

Yitang Zhang proved that there are infinitely many prime pairs differ by at most 70,000,000.

ex) It is cold today. (X)

ex) This statement is false. (O)

Def) p, q : propositions.

The <u>conjunction</u> of p and q is
$p \wedge q$ = p and q.

The <u>disjunction</u> of p and q is
$p \vee q$ = p or q

The <u>negation</u> of p is
$\neg p$ = not p.

Truth table

p	q	$p \wedge q$	$p \vee q$
T	T	T	T
T	F	F	T
F	T	F	T
F	F	F	F

p	$\neg p$
T	F
F	T

<u>Note</u> (operator precedence)
When $\neg, \wedge, \vee$ are mixed
we compute $\neg$ first, and the $\wedge$
and finally $\vee$. $\neg \to \wedge \to \vee$ 순서로

ex) $\neg p \vee q \wedge r$ means $(\neg p) \vee (q \wedge r)$

This is similar to $-, +, \cdot$ (⊗)
$\updownarrow \quad \updownarrow \quad \updownarrow$
$\neg \quad \vee \quad \wedge$

ex) $-5+4\cdot 3 = (-5)+(4\cdot 3)$

We will often use parentheses to avoid confusion.