

THU-Discrete Mathematics-Homework-1

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1 Homework

1.1 Judge the statements

- $P \rightarrow P$

P	Value
T	T
F	T

Table 1: The truth table of $P \rightarrow P$

So $P \rightarrow P$ is a **tautology**.

- $(P \vee Q) \rightarrow (P \vee Q)$

We use R to denote $P \vee Q$, so according to the tautology $P \rightarrow P$, we know $(P \vee Q) \rightarrow (P \vee Q)$ is also a **tautology**.

- $\neg((P \vee Q) \rightarrow (Q \vee P))$

P	Q	Value
T	T	F
T	F	F
F	T	F
F	F	F

Table 2: The truth table of $\neg((P \vee Q) \rightarrow (Q \vee P))$

So $\neg((P \vee Q) \rightarrow (Q \vee P))$ is a **contradiction**.

1.2 Judge the propositions

- **This pot of jasmine is so fragrant** is not a proposition, because this is a **exclamations**.
- **12 is a prime number** is a proposition, and its truth value is F.
- $x + y = 2$ is not a proposition, because we do not know what do x and y denote.

1.3 Use symbols to denote

1 Use P to denote *today is cold*, Q to denote *it is snowing*:

a $P \rightarrow Q$

b $P \leftrightarrow Q$

c $Q \rightarrow P$

2 Use P to denote *today is cold*, Q to denote *it is snowing*:

a Either it is not cold today, or it is not snowing.

b Either it is cold today, or it is not snowing.

1.4 Answer

1 I guess when $P = \text{F}$ and $Q = \text{T}$, the value of entire statement is T .

2 The truth table is:

P	Q	Value
T	T	F
T	F	F
F	T	T
F	F	F

Table 3: The truth table of $(P \rightarrow Q) \wedge \neg(P \leftrightarrow Q)$

1.5 Formalize the following natural statements

Use P to denote *He is tall*, Q to denote *He is fat*

1 $P \wedge Q$

2 $P \wedge \neg Q$

3 $\neg(P \vee Q)$

4 $\neg P \wedge \neg Q$