Discrete Math Notes

Propositions, Negations, Conjunctions and Disjunctions

A **proposition** is a declarative statement that is either true or false

- Eg, "The sky is blue", " The moon is made of cheese"
- Example of what is *not* a proposition, "Sit down", "X+1 = 2". The last one is not a proposition because it is not true *or* false
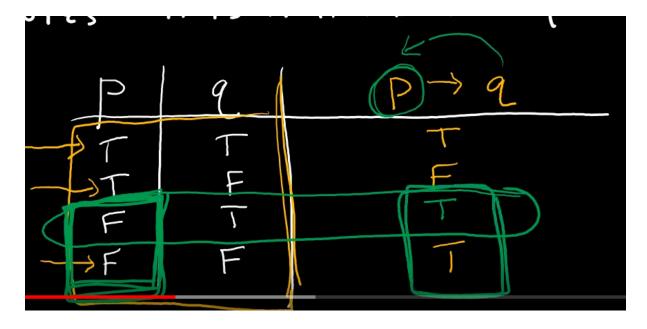
A compound propoisition is comprised of propositions and one or more of the following connectives

- Negation ¬ "NOT"
- Conjuction ^ "AND"
- Disjunction v "or"
- Implication → "If, then"
- Bicondition ↔ "if and only if"

Implications (Converse, inverse, contrapositive) and Biconditionals
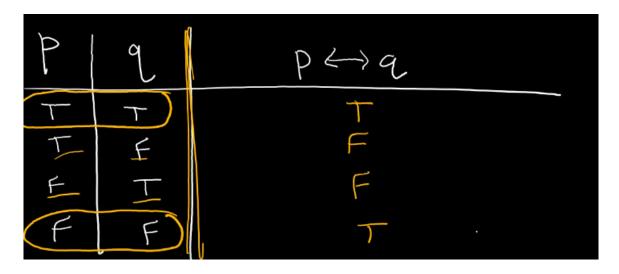
Implication (conditional statement)

- When the hypothesis is true, the conclusion must be true for the implication to be true.

- Converse, if the implication is p → q, than the converse is q → p (switching order)

- Inverse, if the implication is p → q, than the inverse is ¬p → ¬q (negate)

- Contrapositive, if the implication is p → q, then the contrapositive is ¬q → ¬p (switching the order and negate). Contrapositive will always have the same truth values as the implication

For a biconditional to be true, both propositions must share the same truth value

p	q		p ⟷ q
T	T		T
T	F		F
F	T		F
F	F		T

Overall

p	q	p → q	q → p	(p→q)∧(q→p)	p ⟷ q
T	T	T	T	T	T
T	F	F	T	F	F
F	T	T	F	F	F
F	F	T	T	T	T