10/18/11
MATH 300
Informal summary 1.5

- indirect proofs - based on tautologies that replace the statement to be proved by an equivalent statement or statements
- proof by contraposition - uses tautology
  (contrapositive proof) $(P \Rightarrow Q) \Leftrightarrow (\sim Q \Rightarrow \sim P)$

  ↳ Proof: Assume $\sim Q$.
  ⋮
  Therefore, $\sim P$.
  Thus, $\sim Q \Rightarrow \sim P$
  Therefore, $P \Rightarrow Q$.

- proof by contradiction - indirect proof dealing with logic that if a statement cannot be false, then it must be true.

  ↳ Proof! Suppose $\sim P$.
  ⋮
  Therefore, Q.
  ⋮
  Therefore, $\sim Q$.
  Hence, $Q \wedge \sim Q$ is a contradiction
  Thus, P.
- Proof of biconditional sentence or Two-Part Proof of $P \Leftrightarrow Q$
  ↳ proof: (i) Show $P \Rightarrow Q$
  (ii) Show $Q \Rightarrow P$
  Therefore $P \Leftrightarrow Q$

<u>Note</u>! part (i) and (ii) may use different methods to prove their thruths.

→

- *parity* - attribute of being odd or even

- In some cases it is possible to prove a bicond. sent. $P \Leftrightarrow Q$ that uses the "iff" connective throughout. This amounts to starting w/ P and then replacing it w/a sequence of equivalent statements, the last one being Q. With n intermediate statements $R_1, R_2, \ldots, R_n$, a bicond. proof of $P \Leftrightarrow Q$ has the form:

→ Proof:

P iff R_1
iff R_2
...
iff R_n
iff Q.

- Undecidable - when a statement and its negation cannot be proved either true or false (consistent axiom statements such that neither their statement nor its negation can be proved.)