

Slide 1

### Administrivia

- Reminder: Homework 1 on Web, due next Monday.

Slide 2

### Minute Essay From Last Lecture

- Question:
  - Suppose we have  
 $W$  is “Water is wet.”  
 $L$  is “There is life on Mars.”
  - Write as wffs the following:  
“Water is wet and there is life on Mars.”  
“There is life on Mars if water is wet.”
- Answer?

### Propositional Logic, Review

Slide 3

- Define statements, connectives, wffs.
- Define “valid argument” / proof sequence:
  - Start with hypotheses.
  - Apply derivation rules until we get conclusion. Derivation rules can all be proved, and should seem plausible as well.

### Building Blocks for Proof Sequences

Slide 4

- Equivalence rules (two-way), p. 23. Notice that these *can* be applied to parts of wffs.  
Example: “Implication” says that if we have  $P \rightarrow Q$  we can replace it with  $P' \vee Q$ , or vice versa.
- Inference rules (one-way), p. 24. Notice that these *cannot* be applied to parts of wffs.  
Example: “Modus ponens” says if we have  $P \rightarrow Q$  on one line, and  $P$  on another, we can write down a new line  $Q$ .
- “Deduction method”: To show that  $P_1, P_2, \dots, P_n$  guarantee conclusion  $R \rightarrow Q$ , we can show that  $P_1, P_2, \dots, P_n, R$  guarantee  $Q$
- Derived inference rules, p. 31. Notice that many of these are proved as problems, and you should only use them for later problems. (E.g., okay to use the results of problem 23 in problem 25, but not vice versa.)

### Hints for Constructing Proof Sequences

Slide 5

- Heuristics (p. 26):
  - Consider using modus ponens often.
  - Consider using De Morgan's laws to simplify (?)  $(P \vee Q)'$ ,  $(P \wedge Q)'$ .
  - Consider using equivalence rules to convert  $P \vee Q$  to  $P' \rightarrow Q$ .
- Sometimes helps to “work backward” — figure out an intermediate result from which you could reach the conclusion, then figure out how to get the intermediate result. If you do this, though, must still construct proof “going forward”.

### Examples

Slide 6

- Lawyer example from start of chapter.
- Problem 20 in section 1.1.
- Problem 25 in section 1.2.

## Minute Essay

- Do you feel well-prepared to do homework 1?

Slide 7