Slide 1

Administrivia

- Reminder: Homework 2 due Monday.
- One-page summaries of rules for propositional and predicate logic on Web ("Useful links and other resources" page). Also distributed in class.
- Quiz solutions on Web. Homework solutions distributed on paper only.
- Note that we will skip 1.6 for now, and 1.5 completely.

Slide 2

Homework 1 Review

- Showing that something is a tautology using a truth table:

  Goal is to evaluate formula for all ways of assigning true/false to statements — so how many lines?

  What should you conclude if you get "false" for some line?

- In proof sequences, be sure to explicitly number lines (for readability).

  Applying rules should be strictly mechanical (substitute expressions you have for P, Q, etc., in rule). Remember that only equivalence rules apply to sub-formulas.

  Strictly speaking, apply only one rule per step. I'll allow omitting steps, but only when it's very clear; avoid if not sure.

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Predicate Logic, Recap / What Next?

- Now we have a set of derivation rules for predicate logic (we'll add a few more for convenience later).
- As with propositional logic, we could show that these rules are "sound" (if we can prove something, it's true/valid) and "complete" (if something is true/valid, we can prove it).

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Temporary Hypotheses

- In propositional logic, we allowed proving a conclusion of the form $P \rightarrow Q$ by adding P to the list of hypotheses and proving Q.
- Along the same lines, we allow "temporary hypotheses":

  Suppose as part of a proof we want to show that $R \rightarrow S$ follows from the hypotheses. If $R \rightarrow S$ is the conclusion, deduction method works. What if it's not? Then we can't just add R to the list of hypotheses. What to do?
- One solution would be (in mathspeak) a lemma ("branch" or side proof).

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Temporary Hypotheses, Continued

- Another solution is basically an inline lemma:
  - Introduce "temporary hypothesis" T.
  - Derive some more steps from earlier results and T, ending with S.
  - Conclude that $T \rightarrow S$.

  Note that the formulas we derive from earlier steps and T might depend on T, so — indent to make it clear that they're not part of the main proof.
- Example — section 1.4 problem 21.

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One More Rule, a Conclusion

- One more rule — negation (example 32 p. 53).
- A conclusion — the goal of formal logic is to make arguments as meaningless as possible (!) — i.e., abstract out everything that doesn't matter, and apply formal mathematical rules to what's left.

Another Example

- Section 1.4 problem 31.
- (To be continued, and more examples next time.)

Slide 7

Minute Essay

- Are you keeping up with the reading, and is it helpful?
- Are you finding it helpful to do the “not to turn in” problems?

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