Slide 1

Administrivia

- Homework 2 on Web. (PostScript and PDF versions are nicer-looking than HTML.)
- Quiz solutions will be available on the Web, usually shortly after class.

Slide 2

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).
- Examples: Section 1.4 problems 7 and 9.

Slide 3

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).

Slide 4

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.

Slide 5

One More Rule, and 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.

Slide 6

Minute Essay

- Use predicate logic to prove that the following argument is valid: "All CS majors must take Discrete Structures. Some CS majors are also physics majors. Therefore, some physics majors must take Discrete Structures." Use predicates $C(x)$, $D(x)$, and $P(x)$.