

Slide 1

### Administrivia

- Homework 2 graded.
- Homework 3 due date extended to Friday.
- Reminder: For minute essays with “right answers”, answers will be in final version of notes on Web.

Slide 2

### Review/Recap/Overview — Doing (Less Formal) Proofs

- In chapter 1, proofs were like the ones you might have done in a geometry class — very structured, well-defined rules, like a game with a finite number of allowed moves.
- In chapter 2, we use some of what we learned (e.g., De Morgan's law), but proofs are less formal. Easier in that there's less detail; more difficult in that what's allowed is not so well-defined.
- Focus is meant to be more on “proof obligations” and structure of proof than on details.  
(E.g., review how the question in the minute essay for 2/10 was phrased.)

Slide 3

### Mathematical Induction — Recap

- Questions usually phrased as “prove that  $P(n)$  is true for all integers  $\geq n_0$ ”, where  $P(n)$  is some statement about  $n$  (equation, not formula).
  - Two “proof obligations”:
    - Base case — usually just  $n_0$ , but sometimes must include few numbers right after  $n_0$  as well. Example — problem 66 in section 2.2.
    - Inductive step. What generally works, assuming inductive hypothesis is equation ( $f(k) = g(k)$ ):
      - \* Write down one side of equation to be proved ( $f(k + 1)$ ).
      - \* Rewrite it so it somehow includes  $f(k)$ .
      - \* Replace  $f(k)$  with  $g(k)$ , then do algebra to show the whole expression equals  $g(k + 1)$ .
- If proving an inequality, often helpful to use the fact that if  $x \leq y$  and  $y \leq z$ , then  $x \leq z$ .

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### More Examples

- Section 2.2 problem 31 recap (we were meant to notice problem 28!).
- Section 2.2 problems 66 (similar to Example 24).
- Other examples?

## Minute Essay

- TBA

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