

Math 131 notes

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Contents

1	Review: Pólya's problem-solving principles	1
2	Notes on the homework	2
3	Reading graphs: delayed until Monday (or later)	2
4	Homework	2

Notes also available as PDF.

1 Review: Pólya's problem-solving principles

These are **principles** and not a recipe or a plan. Use these to *form* a problem-solving plan. (Problem solving itself is a problem...).

- Understand the problem
- Divise a plan
- Carry out the plan
- Examine the solution

Some tactics we've covered:

- Making lists or tables
- Guessing
- Dependencies, or working backwards
- "Trial and error", but a bit more systematically and quickly through bisection
- Using simpler sub-problems to find patterns

2 Notes on the homework

- The goal of homeworks is practice on the topics covered in the text and in class. If you're unsure how to tackle one problem, look at the problems nearby or at examples. One may be more clear to you and help you with the assigned problem.
- I have office hours now. Monday and Wednesday 1.30pm to 2.30pm (or possibly later) in the Math Lab down the hall.
- Be sure to read the **entire** problem. Many submissions contained only partial answers even when it was clear you understood the mechanism.
- With problems involving large numbers, expect most calculators and computer software to break. Try to *check* results using properties of the input numbers. For example the product of two numbers with units digit 1 also has units digit 1. Or that the product of two d digit numbers has either $2d$ or $2d - 1$ digits. (Think about long-hand multiplication to find these and other properties.)
- If there are questions about which problems were assigned or what the problem is asking, contact me even if it's the night before the homework is due! I may not respond instantly, but it's worth a shot.
- Because there was apparent confusion over which problems were assigned, I will start providing the homework on a separate page as well as directly in the notes.
- In general, writing out steps cushions the blow if the result is incorrect. And writing out *reasons* helps even more. If your homework must be late, reasoning in your own style and words shows you did not just copy solutions. *This class is as much about the method of thinking and communicating as it is about the final results!*
- Remember that homework is one 20% chunk. But there will be 14 or 15 assignments. Each is at *most* ... And if there are 10-20 problems per assignment, then each assignment is at most... This is another reason why homeworks are frequent. The impact of each assignment is a little less when there are many.

3 Reading graphs: delayed until Monday (or later)

4 Homework

Practice is absolutely critical in this class.

Groups are fine, turn in your own work. Homework is due in or before class on Mondays.

- Following Pólya's principles, write a careful solution for the following problems:
 - From last week's homework: Section 1.2, problems 9 and 49
 - From this week's homework: Section 1.3, problem 40

For the write-up, use each of Pólya's principles as a section heading. Begin with a section on **Understanding the Problem** (or an equivalent phrase) detailing what you have, what you want, and what (if any) relationships you see immediately. Then under something like **Devise a Plan**, construct a detailed plan. In **Carry out the Plan**, perform whatever operations are required. Then under **Examine Your Solution** (or Look Back, *etc.*), check your solution and rephrase it in English

- Using whatever calculator or program
 - Compute $1/7$. Write down the number exactly as displayed. Then subtract what you have written from the calculator's or program's result. For a calculator, divide one by seven and then subtract off what you see without storing the result elsewhere. For a spreadsheet or other interface, divide one by seven. Then compute $1/7 - .14\cdots$ for whatever was displayed. **What is the result? What did you expect? What result did others find?**
 - Enter $.1$ into whatever device you use. Add $.1$ to it. Repeat eight more times, for a total of $10 \cdot .1$. Subtract 1. **What is the result? What did you expect? What result did others find?**

Note that you *may* email homework. However, I don't use MicrosoftTM products (*e.g.* Word), and software packages are notoriously finicky about translating mathematics.

If you're typing it (which I advise just for practice in whatever tools you use), you likely want to turn in a printout. If you do want to email your submission, please produce a PDF or PostScript document.