Guidelines for Laboratory Reports in Math 2325

Contents

The guidelines on pp. xvi-xviii of the text (p. vi-viii in the PDF version) are a good starting point (see below). You should have all or most of the things listed there, including the "Introduction" section, though you do not have to put everything in the same order and style as suggested there (but you may).

You will find it useful to keep a laboratory notebook of all your experiments, jotting things down as you do them and recording your observations and guesses. Your notebooks can be the basis for discussion with fellow students as well as for writing a report summarizing the results of your investigation.

Writing a report is an invaluable opportunity to clarify and refine your thinking. Your instructor may specify which questions your report should address, or you may choose a cluster of related questions which interest you. We suggest that you write your report so that it makes sense to a reader who has taken a semester of college level mathematics but has not worked with this material. (If you have a friend who fits this description and is willing to read and comment on your drafts, you have a treasure!) You should write in full sentences and paragraphs—no cryptic strings of formulas. Try to be both clear and interesting. Look at a math text you've particularly liked or an article you enjoyed reading to get an idea of the tone and style to aim for.

Your introduction should describe the topic under investigation in a way that engages the reader's interest. You may need to provide some background or context for your investigation. Define with care the terminology that you will use, since precise descriptions of the phenomena you observe are essential. (Sometimes it is easiest to write the introduction last!) The body of your report naturally falls into four sections.

1. *Your experimental strategy or design.*

You should motivate the questions you ask—and the order in which you ask them—and explain the logic of your choice of examples. Here are some specific suggestions to get you started.

(a) Describe your first example.

- *What was it?*
- *Describe it geometrically and/or algebraically.*
- *Why did you choose it?*
- *What happened when you carried it out?*

(b) What did you try next? Why? What were your results?

(c) What eventually evolved as your general strategy for choosing examples? Why?

2. *Results of your experimentation.*

You should organize your data carefully and give thought to how you display your results; make effective use of tables, graphs, and pictures.

(a) Describe how your various examples worked out, being as clear as you can, but omitting details that don't seem important.

(b) Attach tables or graphs or sketches to your description, where appropriate. Give each a clear, informative title. However, don't include anything you don't refer to in your discussion section.

3. *Analysis of data.*

Organize the discussion of your data carefully, and refer to your results by citing the titles and numbers you assign. (E.g., a report on chapter 6 might refer to: "Table 3, Mersenne primes.") Explain how your data support your conjectures.

(a) What patterns do you observe in your data?

(b) Formulate your conjectures. Which patterns do you guess represent real phenomena, rather than accidental regularities of the examples you happened to choose?

(c) Justify your conjectures. Your choice of examples should test your conjectures stringently—try to rule out "chance" regularities.

4. *Mathematical analysis of conjectures.*

Back up your empirical argument with an analytical and/or theoretical one when you can.
(Mount Holyoke College, Laboratories in Mathematical Experimentation, Springer-Verlag 1997, pp. xvi-xviii.)

Format

You must submit your report in PDF format. You may put in diagrams, equations, tables, etc. neatly by hand and scan them into your document. A cover sheet is not necessary; just put your names on the first sheet.

Rubric

Your projects will be graded on the following scale:

- **A (90+)** Thorough investigation, all questions answered, backed up by careful testing; at least some of the conjectures proved. Writing is clear and organized.
- **B (80-89)** Patterns from well-organized data noticed and described, backed up by thorough testing. Writing does not interfere with your meaning, and is somewhat organized.
- **C (70-79)** Good experimental design and organized data collection. Writing is satisfactory.
- **D (55-69)** Some relevant data collection, not necessarily organized. Writing interferes with meaning, but satisfies minimal standards.
- **F (0-54)** Minimal or no work.

By Art Duval. Last modifications by Helmut Knaust 8/25/2020.