Memorial University of Newfoundland

Department of Mathematics and Statistics

Applied Mathematics 2130

Technical Writing in Mathematics

Course Outline and Manual

© 2009 Department of Mathematics and Statistics

The revised Winter 2009 edition was prepared by Sergey Sadov in collaboration with Danny Dyer and Ivan Booth and with the technical assistance of Karen Williams and Melissa Roberts. Changes in the Fall 2009 edition include Section 2.4 and Index added by Sergey Sadov and numerous small corrections.

Previous contributors to this Manual include the Instructors of Applied Mathematics 2130 from the Department of Mathematics and Statistics at Memorial University of Newfoundland, 1994–2007. As well, there are technical contributions from the systems personnel at the Department of Computer Science, and external contributions (reproduced with permission) from David Goss (Ohio State University), Steven Kleiman (MIT), Gavin Maltby (University of Natal), and Glenn Tesler (MIT).

Printing and Binding by MUN Printing Services.

© MMIX Department of Mathematics and Statistics, Memorial University of Newfoundland
September 4, 2009

Contents

1 Introduction **1**
- 1.1 The course and this Manual . . . 1
- 1.2 Submissions . . . 2
- 1.3 Policies . . . 2
  - 1.3.1 Evaluation . . . 2
  - 1.3.2 Academic integrity and academic misconduct . . . 3
    - A. Forging research results . . . 4
    - B. Plagiarism . . . 4
  - 1.3.3 Collaborative work . . . 4
  - 1.3.4 Use of online materials . . . 5
- 1.4 MUN Writing Centre . . . 5

2 Technical writing **7**
- 2.1 Technical versus non-technical writing . . . 7
- 2.2 Writing process . . . 8
- 2.3 Organization of report . . . 9
  - 2.3.1 General requirements . . . 9
  - 2.3.2 Title page . . . 10
  - 2.3.3 Table of contents . . . 10
  - 2.3.4 Abstract . . . 11
  - 2.3.5 Introduction and Conclusion . . . 11
  - 2.3.6 Technical details . . . 14
  - 2.3.7 Results and Analysis . . . 17
  - 2.3.8 Acknowledgements and References . . . 18
  - 2.3.9 Appendix . . . 19
- 2.4 Suggestions about style . . . 20
  - 2.4.1 A note on spelling . . . 20
  - 2.4.2 Squeeze water out (Eliminate unnecessary words) . . . 20
  - 2.4.3 A note on "strong words" . . . 21
  - 2.4.4 Common words in mathematical writing . . . 21
  - 2.4.5 *We* versus *I* . . . 22
  - 2.4.6 Verb forms: tense, mood, modal verbs . . . 22

© MMIX Department of Mathematics and Statistics, Memorial University of Newfoundland
September 4, 2009

3 Typesetting with LaTeX **24**
3.1 Elements of LaTeX . . . 24
3.1.1 Preamble . . . 24
3.1.2 Comments . . . 25
3.1.3 Environments . . . 25
3.1.4 Space . . . 26
3.1.5 Math mode . . . 28
3.1.6 Lists . . . 29
3.1.7 Advanced math typesetting . . . 30
3.1.8 Processing and viewing LaTeX files . . . 30
3.1.9 Including source code in LaTeX documents . . . 31
3.1.10 Some commands defined in `2130.sty` . . . 33
3.2 Formatting your Math-2130 report in LaTeX . . . 34
3.2.1 Title page, footers and headers . . . 34
3.2.2 Table of contents . . . 35
3.2.3 Abstract . . . 35
3.2.4 The body of report . . . 36
3.2.5 References . . . 36
3.2.6 Appendix and program source . . . 36
3.2.7 Floating environments: figures and tables . . . 37
3.2.8 Automatic numbering, cross-references, and citations . . . 37
3.3 An introduction to TeX and friends (*G. Maltby*) . . . 38
3.3.1 An Introduction to TeX . . . 38
3.3.2 A review of LaTeX . . . 40
3.3.3 Special symbols . . . 41
3.3.4 Formatting . . . 45
3.3.5 Document structure . . . 52
3.4 Mathematical typesetting with LaTeX (*G. Maltby*) . . . 61
3.4.1 Introduction . . . 61
3.4.2 Displaying a formula . . . 64
3.4.3 Using mathematical symbols . . . 65
3.4.4 Some common mathematical structures . . . 70
3.4.5 Alignment . . . 77
3.4.6 Theorems, Propositions, Lemmas, ... 78

4 Computer-assisted research: programming and graphing **80**
4.1 Programming . . . 80
4.1.1 Development process . . . 80
4.1.2 Programming style . . . 83
4.1.3 Generating graphics data with your own program . . . 84
4.2 An introduction to Maple . . . 87
4.2.1 Basic Arithmetic and Algebra . . . 87

4.2.2 Equations . . . 89
4.2.3 Calculus . . . 90
4.2.4 Arrays . . . 92
4.2.5 Linear Algebra . . . 93
4.2.6 Programming . . . 94
4.3 Drawing graphs . . . 96
4.3.1 Postscript Files . . . 97
4.3.2 Maple graphics . . . 99
4.3.3 Gnuplot . . . 107
4.3.4 Using XFig to make diagrams . . . 112
4.4 The LaTeX `picture` environment and enhancements . . . 114
4.4.1 Introduction . . . 114
4.4.2 Lines . . . 115
4.4.3 Enhanced Pictures . . . 115
4.4.4 Superimposition . . . 122

5 Local system particulars **123**
5.1 Electronic submissions . . . 123
5.2 Laboratory computers on campus . . . 124
5.2.1 Where . . . 124
5.2.2 Your computer account . . . 124
5.2.3 Printing . . . 125
5.3 Software . . . 126
5.3.1 Processing LaTeX files in the command line . . . 126
5.3.2 Kile — integrated LaTeX environment . . . 127
5.3.3 Compilers . . . 127
5.3.4 Maple . . . 128
5.3.5 Miscellaneous . . . 128

Appendix A: Quick reference on UNIX **130**
A.1 Files . . . 130
A.2 Directories . . . 131
A.3 Pathnames . . . 133
A.4 Shell . . . 133
A.5 Basic UNIX commands . . . 134
A.6 Working with directories and files . . . 135
A.7 Redirection of output . . . 138
A.8 Access privileges . . . 138

Appendix B: Two papers on mathematical writing **139**
B.1. Writing a Phase II Math Paper (*S. Kleiman*, MIT). . . . 139
1 Introduction. . . . 139
2 Organization. . . . 141

3 Language. 143
4 Mathematics. 146
5 Example. 148
Appendix. Advanced mathematics 150
B.2. Some Hints on Mathematical Style (*D. Goss*) 152

Index **155**