Lab Projects for Ma113

Lab projects are generally stated as a topic of investigation rather then as a specific exercise. You are required to perform a detailed analysis of the problem. This will include: setting up the problem, making a labeled diagram of the problem with information acquired, performing the necessary calculations and visually displaying the results (usually as graphs of functions). You must then organize this information into a full written report.

Lab projects are done by collaborative groups of three or four students who are expected to organize themselves, do the work, and prepare the report as a group. Each person in the group must sign the final report and be aware that in doing so he or she is guaranteeing that everyone who signed has done his or her fair share of the work. This does not mean that everyone did exactly the same number of tasks, spent the same amount of time, etc. It may well be the case that one member of the group provides the majority of the ideas, another provides the organization and direction, and another actually prepares the "write-up". It does mean that each person who signs the final report is personally satisfied that every author contributed in fair measure *and fully understands the report.*

The reports will be graded with each student in the group receiving the group grade. The grade may be determined either by the written report alone or in equal measure by an oral presentation by a randomly selected member of the group. Report grading will be on correctness, completeness, correct English, demonstration of understanding of the problem and solution, and style. Bonus points may be given for originality.

The following are general guidelines and expectations:

The Lab Session:

- Get started immediately. You will not be able to complete the project all in the last minute. Do not waste this valuable time.
- Read over the laboratory material carefully before you begin discussing or completing any part of it. This should be done before the lab sessions designated for this activity. Give some advanced thought to what you are going to do and the anticipated form of the report you are going to prepare.
- Initially you may have some trouble getting started. Don't panic, a discussion with your group partners will usually generate some ideas. Your TA can also give you a 'push' in the right direction. There will likely be a general

discussion on the problem in lecture. Your TA may also be able to make suggestions as to how to organize your efforts.

- The generality of projects like these tend to make them quite different from the standard "exercises" of the homework. You will need to make assumptions to simplify the problem. Be sure to discuss such assumptions in detail in your final write-up.

- Plan on spending some time outside of lab on the report. In particular, plan on writing the final report outside of class.
- Your TA will be happy to go over complete drafts of your final report with you if they are ready at least two days before the submission deadline. He or she will then be able to point out areas of concern and make suggestions on improving the final submission.

The Lab Report: The report should be readable by anyone who can understand the mathematics with no reference to any other source It must at least have the following identifiable features:

1. **A Cover Page** signed by each member of the team which produced the report. A signature on a report means that each person signing attests to the fact that each contributed approximately equally to the work. Each member of the team is responsible for any errors; each member of the team may be asked to explain any detail of a report.
2. A **complete statement of the problem**
3. An **analysis** of the problem, complete with carefully drawn sketch which contains a complete explanation of the solution, derives and explains all equations and sets up all calculations that need to be done. This may be done as part of a Maple worksheet and should contain carefully annotated graphs of the pertinent functions. This is the most important part of the report.
4. **Details of the calculations** (this can be an annotated Maple worksheet. It must be clear to the reader what each calculation is intended to do. This can be done with comments.

   The report should be free of any extraneous calculations. Do not include any intermediate calculations unless you need to refer to them or you feel that their presence makes the report easier to read.

   Most of the graphs will be in this section. It should be clear to the reader why one doing a certain graph before it is actually done. This can be done with a comment. Features of importance on a graph should be labeled and interpreted either on the graph itself or immediately following it. For instance the axes of all graphs should be labeled and a caption provided for each graph which explains its purpose. This labeling can be done by hand on computer-generated drawings. The function(s) being graphed should be in the caption or penciled on the graph.
5. **Conclusions and interpretations** . At the very least this should briefly explain how what has been done answers the original question or solves the original problem. If appropriate, it should refer back to graphs and relate features of the graphs to numerical calculations. Finally, there should be a summary paragraph or sentence describing what has been accomplished and (possibly) suggesting directions for further study. problem(s).

A good report will not be very long - probably three to five typed pages, excluding graphs.

The report should be free of any extraneous calculations (e.g. material that should have been cut out of a worksheet.)

Finally, there should be a summary paragraph or sentence describing what has been accomplished and (possibly) suggesting directions for further study. problem(s).