Guidelines for Math 3200 Mini-Projects

Overall - write the project as if the reader had not seen the project description and assume the reader is a classmate. The points listed in the project should be covered, but you should incorporate them into the report not in a listed fashion, but as part of the written report - think about *why* they are a point to be discusses...

Introduction Give a sentence motivating the problem - e.g. We would like to examine different models for the free-fall of an object...., and then give a brief introduction of how you plan to do this. Often the last few sentences of the introduction summarize what is actually done in the report, for example: "First we look at a very simple model under the assumption that.... and then we examine a more realistic model... Finally we compare the results of these two models..."

Main Body

- Always use complete sentences.
- Equations are part of sentences - they should have punctuation at the end of each sentence (comma, period...).
- Motivate each and every paragraph as much as possible. Why are you going to do what you are doing? e.g. Where did the mathematical model come from? Why are you considering the initial conditions?
- Instead of just listing the parts of the projects given in the project descriptions, see if you can decide why it's important to do each part. For example instead of "Check that $l(0) = 10$ and $l(10) = 15$" followed by calculations, try "In order to check our solution we want to be sure that the length of the reservoir is 10 when the reservoir is empty ($h = 0$), and that it is 15 when the reservoir is full ($h = 10$).
- Define all variables, including units.
- Use words instead of symbols wherever possible - for example, instead of "Now consider $F_e = -kv^2$" use "Next we model air friction as being proportional to velocity squared, $F_e = -kv^2$". This helps remind the reader what the symbols mean (you've been working with the symbols for at least a few days, and they are very familiar to you, but a reader has only just been introduced to them).
- Algebra is not as important as the explanation. If there is a long calculation, you can put it in an Appendix and it can be hand-written. So for example, after giving an initial value problem, you can just say, "This problem was solved using the technique of integrating factor and the solution is .... The details of these (rather long) calculations are given in Appendix B."
- Justify any statement which says something is "good" or "better than... " by refering to a graph, or by comparing with some data you found elsewhere (be sure to cite).
- Although it's not necessary to provide any references for these projects, if you did use references to give you some ideas, list them. If you used an idea specifically from the reference (a really clever idea of solving an equation, or something about the physics of the problem), cite the reference in the report. *There is no excuse for plagiarism. If you plagiarize, you may get a zero on the project and an F in the course.*
- Please use at least 1.5 spacing (half way between single and double spacing) to give me room to edit.
- Number key equations (you don't have to number all of them) so that you can refer back to them as needed. Usually the numbers are in parenthesis and are located to the right of the equation, e.g. Consider the following equation,

$$\frac{dx}{dt} = -x^2 t, \tag{1}$$

where x is the distance...

Conclusion Try to summarize what you have learned. Try to think like the boss in a company and analyze it - so for example, is your model reasonable? What physical assumptions were assumed in arriving at the model? If comparing two parts, try to draw as many conclusions as you can - why are the results different where they are different? Do they make sense when considering the physical model?

Grading

Math: 70% (this is a math class)

Writeup: 20% Grammar, complete sentences, defining variables, motivation of what you'd like to do next.

Analysis: 10% Do the results make sense? Comparing the results with graphs, what you know about the physics... Comparing two results with each other. Evaluating the results (reasonable? under what conditions?).