A Note on Reporting Programming Assignment Results

August 21, 2026

Introduction

Some programming assignments will include specific questions that require explanation or analysis, e.g., proving a particular convergence rate. Answers to these questions should be included in a section separate from the solution to the programming assignment with each solution clearly labeled to indicate the portion of the assignment addressed. In some cases, these answers will require verification experimentally. They should be included with each solution in this section unless specifically instructed otherwise.

When reporting your results for a programming assignment the following format is recommended. It comprises seven sections each of which provide a different level of detail of the problem and its solution. Your goal in writing it is to demonstrate that you: understand the problem, identified and understand the relevant practical and theoretical aspects required for its solution, designed an efficient implementation of the codes required for the solution, and carefully designed a set of experiments that strongly support the correctness of your implementation. The sections and their purposes are described below.

I. Executive Summary

This should be a very short summary of the problem solved, the methods used, the results and the conclusions. It is not meant to give the details necessary for grading. For example,

> A fourth order Taylor polynomial was used to approximate $exp(x)$ on $[-1, 1]$. An analytical error estimate was derived. Computed results show the true error to be within 10% of the estimated error.

Another example:

> A set of iterative methods for solving nonlinear equations were evaluated as to their effectiveness in determining the parameters in the proposed model for the data given. The resulting parameter values were guaranteed to be accurate to three decimal digits.

II. Statement of the Problem

A short summary of the problem to be solved. A few sentences is all that is needed here but it should provide more information than in the Executive Summary. You should not simply reproduce the paragraphs of the homework assignment. This summary shows that you understood the problem and can state it clearly and succinctly.

III. Description of the Mathematics

Briefly describe the mathematics used to formulate and solve the problem. You may of course consult the literature outside of the class notes. **All use of material in these external resources and the class notes must be cited appropriately.** It is extremely important for graduate students to become skilled in writing coherent, concise and relevant arguments and descriptions of the techniques and ideas needed to address problems. **This section is not for duplicating large amounts of tutorial information from the class notes, textbook, or general literature.**

IV. Description of the Algorithm and Implementation

Explain the methods used and how you implemented them. Of particular importance is discussing the aspects of the implementation related to efficiency, i.e., the number of computations and the amount of space required to solve the problem. This should include a description of relevant data structures or techniques used to keep the number of computations at an acceptable level by exploiting structure in the problem. If it is useful you may include short code segments from your solution to clarify the point to be made.

This section should also contain a description of the computational environment in which the experiments we run. This is standard practics in technical reports, journal papers and conference papers. It is important to get used to providing a succint description of the software system, computer, and organization of the testing. The last of these is, of course, related to the next section.

V. Description of the Experimental Design and Results

Describe the motivation behind the design of the experiments. This can be simple or require some significant insight depending on the problem. Recall that you have theory and empirical evidence covering what behavior should be observed for the algorithms we discuss. Use this to design experiments and evaluate relevant properties of the behavior of an algorithm, e.g., convergence rate, error estimates, etc.

The results should be organized and condensed. **Do not turn in pages of raw data!** Since you will be running several problems, consider the careful use of summarizing statistics, such as means and variance, and tables, histograms and graphs. Be sure to give a complete description of the experiments and the conditions under which they were run. Predictions of the results and

comparison with the observed behavior can be made in this section and discussed in a more global fashion in the Conclusions.

VI. Conclusions

This is the most important part. This section contains your structure discussion of the results. You should refer to your predictions, descriptions, and data from earlier sections.

Outliers in the data are often the indicators of problems with the codes. Make sure you explain them or remove them by fixing the bugs responsible. You may have made invalid assumptions in designing the experiments or in your expectations. A good explanation could save an otherwise useless set of incorrect results. The organization should reflect the fact that you are trying to convince the reader that your codes are correct and you understand the problem and its solution. It is important that you show an understanding of the problem, experiements and implementation. Correct answers are not the main or only point.

VII. Program Files

In general, your programming style will not be graded beyond efficient coding that is described above. Your claims of efficient implementation versus the code actually used may be checked and suggestions on coding techniques may be made. This section should include instructions on how to compile and execute your code including the Math Department machine used, if applicable. The source code routines and data/parameter files and a brief description of the function of each should be submitted in an appropriately organized set of additional files, i.e., not in this document. They should be such that they can be executed within the environment you described in your report. You may be called upon to demonstrate the execution of **these files**, i.e.,not ones that have been modifed since submission of the solutions.