Project requirements and expectations

Goals Broads goals for projects in this course are to

- provide practice communicating technical material in written form
- challenge you with more difficult problems that may be open ended with a variety of reasonable approaches
- provide experience in learning material independently

All projects will give you practice in the first goal and one or both of the other goals

Requirements Each project will consist of one or more problems. You can work on the details of problems with others. In fact, I encourage you to do so. Get a group of two or three people together, find a blackboard, and go to it.

For each project, you will submit a carefully written report on your results. All of your writing should be done independently even if you have worked on details with others.

For your writing, you should consider the audience to be peers in a first-semester calculus course who have not looked at the particular problems at hand. You should include enough detail so that a reader in this audience can follow your reasoning and reconstruct your work. Your report should be self-contained and not assume that the reader has separately read the problem statement. Provide at least a brief introduction to set up a context and at least a brief conclusion. In your writing, focus on being precise, concise, and clear.

You should write using the style and tips given on the flip side. When appropriate, you should include carefully drawn figures and plots. Since typesetting mathematics is difficult, you can write projects reports neatly by hand. Another option is to use a word processor and then write mathematical expressions in by hand. You can also use an "equation editor" if one is available in your word processor. For example, in many versions of *Word*, you can go to the `Insert` menu and select `Object...`. On the list in the resulting dialog window, look for `Microsoft Equation Editor`. Using a word processor gives you the advantage of more easily revising but typesetting mathematical expressions is slow.

Project 1 Do Problem 2 from the handout "Constructing definite integrals." (This is the problem of computing the total number of bacteria in a petri dish given the number density.) For this problem, you have had a chance to work out the mathematical content so you can now focus on your writing. Come talk with me if you have questions on the mathematical content or your writing. A draft of your report for this project is due on Friday, October 16. I will provide feedback on the draft and you will later submit a revised draft. The due date for the revised draft will be determined later.

Some notes on writing in mathematics

1. In mathematical writing, use the standard convention of complete sentences in paragraph form. Include each mathematical expression as part of a sentence. This includes both mathematical expressions within a regular line of text *and* mathematical expressions displayed on a separate line.
2. The choice of whether to write a mathematical expression within a regular line of text or to display it on a separate line is made by considering the complexity of the expression and the importance of the expression. Display complex or important expressions on a separate line; include simple expressions within a regular line of text.
3. The conventional style in mathematics is to write in the first person plural using the present tense. For example, use "We solve the equation to get $x = 5$." rather than "The equation was solved to get $x = 5$." or "I solved the equation and got $x = 5$." In the preferred style, "we" refers to the author and reader together. The present tense is used because the logic and reasoning are unfolding in real time. In contrast, science laboratory reports are often written in past tense because you are reporting on an experiment that has already taken place.
4. A central issue to confront in writing mathematics, and in most technical writing, is how much detail to include. Including too much detail (for example, lots of algebraic and arithmetic steps) obscures the main flow of logic and reasoning. Omitting too much detail forces the reader to work hard to connect steps. Consider omitting routine algebraic manipulations and arithmetic steps.
5. The appropriate level of detail depends on the audience. You should have an audience in mind for any writing you do. For this course, you should write for an audience of peers who have the same mathematical background as you but haven't thought about the specific problem at hand. You should give enough detail for a reader to follow the general flow of your reasoning and calculations on a first read and to reconstruct your thinking and work without too much effort.
6. Choose notation carefully. Always give a specific meaning for a new symbol before using that symbol. Remember that upper and lower case versions of the same letter are different symbols.
7. Avoid starting sentences with a symbol or number. For example, use "The slope m_1 is the negative reciprocal of $-4/3$." rather than "m_1 is the negative reciprocal of $-4/3$."
8. Use the words "equation" and "solve" only when these are relevant. A mathematical expression is not necessarily an equation; it may be a formula, an identity, or just an expression. Likewise, there are many mathematical actions other than "solving an equation." For example, one can "simplify an expression," "substitute on the right side of the equation," "factor a polynomial," or "calculate a value."