Elements of a Well-Written

Mathematics Project, Presentation or Article

Titles and Headings

Any paper you write should have a title that is both interesting and informative. Your title should interest the potential reader; be creative and clever. Increasingly though, information is being placed into computer databases and on the Internet, and this information is retrieved by having a computer search for relevant key-words. Thus an informative title uses important words related to the subject of your paper. One way to balance the often incompatible goals of being interesting yet informative is through the use of a creative title with an informative subtitle. For example, an expository paper finding a closed form solution for the Fibonacci numbers which motivated the Fibonacci numbers with a model of rabbit population growth might be entitled *Who Counted Roger Rabbit? A Derivation of Binet's Formula for the Fibonacci Sequence*.

Material that you submit should have a heading including your name, the date, the assignment name, and the course name. This will help you when you look back over your notes and assignments in the future.

Finally, files that you save or turn in on computer disks should also have informative titles. You will probably not be able to locate (in order to study or reuse part of) old files if all your files are entitled *Math Stuff* and *Project.*

How much to include

This depends on your audience. But in general, the principle is to include enough that your audience would be able to verify your results if necessary; but you typically need not show all the intermediate calculations. For example, a college-level paper might contain the sentence. "Thus we arrive at the equation $x^2 - x - 1 = 0$, from which the quadratic equation gives us that $x = \frac{1 \pm \sqrt{5}}{2}$." A statement of the quadratic formula and a presentation of the intermediate steps in finding the roots would probably be inappropriate.

Self-contained

Ideally, any mathematician should be able to pick up your paper and be able to follow your presentation. Usually, a paragraph or two of introduction about the background of the problem or situation will suffice.

As a rule, <u>every</u> function, variable, and parameter that you introduce should be defined. If you write about the function *f*(*x*), then there had better be a sentence stating what *f*(*x*) is. Do not forget that the case of the letter matters - *f* and *F* are not the same function. Notice that all variables should be in italics.

Mathematics versus Mathematica

Whenever possible, write using the standard notation and vocabulary of mathematics rather than the specialized syntax of Mathematica. For example, refer to the ordered set of integers from 1 to 10 rather than `Table[i,{i,1,10}]`, say that you solved an equation rather than saying that you used the `Solve` command, and write about the function $f(x)$ rather than **`f[x]`**.

Mathematical Expressions

Note how much easier $\frac{1-b}{a^2-ab}$ is to read than (1-b)/(a^2-ab). Learn a mathematical typesetting program like Equation Editor. If your paper doesn't involve radical signs or special symbols, then you may be able to use subscripts, superscripts, and dashes for fraction bars in your word-processor. Unless an equation or expression is very short, place mathematical expressions centered on their own lines.

Variables

Avoid re-using variables. Once you use a variable name to denote one quantity, be careful to not use the same variable for something else. Suppose a student who looks up the formula for the volume of a cylinder and writes it as $V = \pi r^2 h$ when either r or h has already been used in the paper. In any case, it would be better to write that "the volume of a cylinder is the area of the base times the height", without the unnecessary reference to variables.

Avoid beginning a sentence with a variable or function name. Instead of the sentence "$f(x)$ is...", write "The function $f(x)$ is..." This avoids the confusion that would result from capitalization, because $f(x)$ and $F(x)$ are two different functions.

Other considerations

A well-written mathematics paper should have many of the same characteristics of a well-written paper for any class. You should use a spell-checker and use good grammar. Write in complete sentences. Make sure that your sentences end. Graphs and diagrams should be labeled as "Figure n" and referenced in the paper, rather than included as part of a sentence. Have an introduction in which you motivate your paper and state your goal in writing the paper very early in the paper. Unless your paper is very short, organize it in sections with appropriate section headings. When you finally obtain your results, state those results in the language of the original problem, not just in terms of the intermediate variables used to arrive at the answer.

A final word from Ralph P. Boas, a well-known mathematician and author, is appropriate in any discussion of mathematical writing.

"*Long convoluted sentences, bifurcating into a plethora of dependant clauses, especially those with verbs deferred to the end, with the consequent effect of demanding close attention from the reader, as well as comprehension of sesquipedalian and abstruse words, or of highly specialized technical jargon, are rebarbative and should be sedulously avoided.*"