Advice for Writing Mathematics

During my time as a math student and a math TA, I have come across many ideas of what constitutes "good" mathematical writing. The original purpose of this document was to distill these ideas into some basic principles that my PUMP I students could use in their journey in mathematics. Whoever comes across this, I hope it helps you in your math classes.

As a rule of thumb, think about mathematics as making an argument. It should be clear and easy to follow. Anyone should be able to look at what you've done and understand both what you are trying to show and why you are correct. At the same time, your answers shouldn't be too long that they need more effort than should be required to read it.

Another way to think about it is like a scientific article. We wouldn't trust a scientific article if the authors didn't clearly explain their methodology and results with solid background evidence. Analogously, your TA won't trust you know what you're doing if you don't back up your solutions with a solid argument.

Tips

- **Use full sentences:** The easiest way to communicate your ideas is through full sentences. As much as it's faster to submit a symbol soup, it's harder for both you and your TA to understand such a solution. This is even more important when your math starts to get more complicated.
- **Avoid the math curse words:** I came across this idea during a tutorial led by Adriano Pacifico. Examples of these words are trivial, obvious, clearly, and any other of that flavour. When these words are used, it usually indicates a lack of understanding or effort. They are also dismissive and demoralizing for people struggling with those details.
- **Have an easy to follow argument:** Since math is an argument, you want it to be well-structured and easy to follow. This means it should be presented in a linear fashion with just enough justification for each "non-obvious" step. Try to reduce the amount of arrows pointing around the page as this just makes your argument hard to follow.
- **Clearly define all variables, equations, and terms:** Don't pull variables/equations/terms out thin air. They should be clearly stated so the reader knows what your saying without any additional thought. I find it helpful to have a sort of "list of variables" when working on exceptionally complicated problems.
- **Clearly state any final answers (with units):** This makes it clear to your TA what your final solution is. Even better if you put a box/circle around your final statement.
- **Write a separate good copy:** Your initial attempt at a math problem might be super messy as you try out different ideas. If you have enough time, you might want to make a good copy that is well-presented.
- **Don't include false mathematical statements:** Never write false mathematical statements. Even if your whole solution is correct, but includes one unnecessary, false mathematical statement, you will lose marks.

Tricks

- For particularly complicated solutions, include a "solution overview" before your actual solution. For example, if your solution has three major steps, you might want to enumerate those at the start of your solution.
- Include a list of all variables you use, which ensures everything is properly defined and there are no variables that are never used.