TEMPLATE FOR REU PAPERS

YOUR NAME

Abstract. This is a sample latex document with emphasis on using math mode and equation environments. You should use it as a template for your paper. Some pointers are included. Remember that a first draft must be submitted to mentors at the very latest by August 14, with no exceptions. The completed paper must be submitted by August 26, unless permission for a later date has been obtained from the director of the program.

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1. Writing

Before getting to latex comments, I'll say a few words about writing, venting from many years of hard experience.

It is important that what you write is something you would actually like to read. There should be no overuse of symbols. Clusters of symbols can be barbaric. There are subjects whose literature is festooned with sentences written almost entirely with symbols like $\exists$, $\forall$. Don't do that. Never use a symbol for a verb. Never start a sentence with a symbol.

Grammar should be correct. Never start a senence with "Where ...". Mismatches of singular and plural are excruciatingly painful, utterly abhorrent. . You cannot write "Let ..., then ..." That is what is called a run-on sentence. You must write "Let ... . Then ... ." If appropriate, "If ..., then ..." works just fine.

Avoid words or phrases like Simply, Obviously, Just, ..., It is easy to see. They serve only to intimidate or to browbeat the reader into acquiescence. Especially if English is not your native language, make sure you have somebody fluent in English check what you have written.

References to numbered statements are best in the form Theorem 2.3, not just 2.3. Equations should be referred to as (2.3), not 2.3.

Bad writing makes for unpleasant papers, no matter how good the material.

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2. What does the table of contents command do?

The table of contents command will automatically make a contents. You must run tex at least twice for this to work.

3. How do the environment commands work?

"Environments" are commands that are given using the `\begin{}` and `\end{}` syntax. In the preamble, you can see we've defined a bunch of theorem-type environments. For example, to get a definition, you type:

Definition 3.1. This is how to define a definition.

And for a theorem and its proof you type:

Theorem 3.2. *This is the statement of a theorem.*

Proof. And this shows that the statement is correct. □

Note that the numbering is taken care of automatically, and that we've predefined a bunch of these sorts of environments in the header. These take give environments for lemmas, corollaries and such like.

Another useful kind of enviroment is the equation environment. Equations get numbered in sequence with statements, as for example

$$e = mc^2 \tag{3.3}$$

Note that if you do not want a numbered equation, you can use the environment "equation*" like so:

$$e = mc^2$$

But a quicker way to tex the same command and get the same displayed result is:

$$e = mc^2$$

There are plenty of other equation-type enviroments that allow you to align several equations and such like things. The AMS's guide [2] is a good place to start with these.

You can also typeset math directly in a paragraph by placing it within dollar signs. This is called "math mode." For example: Let e be energy, m be momentum and c be the speed of light. Then Einstein's famous equation says that $e = mc^2$. This is useful, but remember that it is harder to read inline math than displayed math.

Remember that letters get put in a different font in math mode, so whenever you are referencing a mathematical object you should always put it in dollar signs. For example, f is a function, but f is just a random letter.

Both [4] and [2] have good lists of other symbols you can use in math mode. These include greek letters ($\alpha, \beta, \Gamma, \Delta$), operators ($\otimes, +, \sum$) and much more ($\leq, \diamond$).

4. Xypic and diagrams

If you want to draw diagrams, you should use xypic. It's actually much easier than it looks, and we've already included it in the header above. Here is an example.

$$\begin{tikzcd} FX \arrow[r, "Ff"] \arrow[d, "\eta_X"'] & FY \arrow[d, "\eta_Y"] \\ GX \arrow[r, "Gf"'] & GY \end{tikzcd}$$

Acknowledgments

You should thank anyone who deserves thanks, and for sure you should thank your mentor. "It is a pleasure to thank my mentor, his/her name, for .... ". Or add anyone else, for example "I thank [another participant] for helping me understand [something or other]"

5. bibliography

The bibliography should list all sources that you have used and referenced. And you should reference anything you use. Especially if you quote any result without proof, you MUST give a reference. And never ever should you copy material directly or more or less directly, from a source.

References

[1] http://www.ams.org/publications/authors/tex/amslatex
[2] Michael Downes. Short Math Guide for LaTeX. http://tex.loria.fr/general/downes-short-math-guide.pdf
[3] J. P. May. A Concise Course in Algebraic Topology. University of Chicago Press. 1999.
[4] Tobias Oekiter, Hubert Partl, Irene Hyna and Elisabeth Schlegl. The Not So Short Introduction to LaTeX2e. https://tobi.oetiker.ch/lshort/lshort.pdf