

TeX and LaTeX

Stanford Professor Donald Knuth invented the `tex` system of mathematical typesetting (TeX). It is freely licensed. Nearly everyone doing mathematics or physics uses it in writing. A version called `latex` (L^ATeX) is now the standard version.

To create a document, you create a text file, with the `.tex` suffix. For example, it might be called `homework1.tex`. Then you run the program `pdflatex` on the file, which creates another file which is called `homework1.pdf`. The precise method of using `latex` depends on your computer setup, so I will tell you what you need to do without telling you exactly how to do it. First create a text file called `conjugate.tex` with the following lines:

```
\documentclass[12pt]{article}
\usepackage{amsmath, amssymb, amsthm}
\newtheorem{proposition}{Proposition}
\begin{document}
\title{Conjugation and Energy}
```

Let G be a finite set, and let $x, y \in G$. We say that x is `\textit{conjugate to}` y if there exists some $g \in G$ such that $g x g^{-1} = y$.

```
\begin{proposition}
Every  $x \in G$  is conjugate to itself. If  $x$  is conjugate to  $y$  then  $y$  is
conjugate to  $x$ . And if  $x$  is conjugate to  $y$  and  $y$  is conjugate to  $z$ ,
then  $x$  is conjugate to  $z$ . Moreover
\[\[E=mc^2.\]
\end{proposition}

\end{document}
```

Run `pdflatex` on the file to obtain a pdf file called `conjugate.pdf`. Assuming that you are able to do this, when you print or preview the pdf file you should see this:

Conjugation and Energy

April 1, 2015

Let G be a finite set, and let $x, y \in G$. We say that x is *conjugate to y* if there exists some $g \in G$ such that $gxg^{-1} = y$.

Proposition 1. *Every $x \in G$ is conjugate to itself. If x is conjugate to y then y is conjugate to x . And if x is conjugate to y and y is conjugate to z , then x is conjugate to z . Moreover*

$$E = mc^2.$$

How does it work?

The first few lines give the instructions to use the article style, 12 point font, and a few useful packages from the American Math Society, namely `amsmath` and `amssymb` (providing support for mathematics) and the `amsthm` package which allows you to easily create environments for theorems, propositions, etc. The line `\newtheorem{proposition}{Proposition}` creates such an environment for Propositions.

Everything between a pair of dollar signs is in “math mode” and `tex` knows that it is to be interpreted as mathematics. Everything between `\[` and `\]` is also in math mode, but rather than being included in a paragraph, it is made into a displayed formula. The commands `\begin{proposition}` and `\end{proposition}` mark the beginning and ending of a Proposition.

You can find some further tutorials at:

<http://www.latex-project.org/guides/>