# Intro to Latex

Roman Kogan

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## 1 Introduction

First, you can just type regular text and it will look nice. To make a paragraph, all you need to do is skip a line in the source (this text is still in the first paragraph)

Woo Hoo! New paragraph now.

## 2 Some math

There are two main ways to put math into the document: inline, like this: $e^{i\pi} + 1 = 0$, and on a math display, like this:

$$\int_0^1 f(x)dx = \lim_{n \Rightarrow \infty} \sum_{i=0}^{n-1} f(nk)\Delta x, \text{ where } \Delta x = \frac{1}{n}$$

If you have several equations, the best way to organize them is by using Equation Array or Align, like this:

$$2 + 2 = 4 \tag{1}$$

$$\sin \frac{\pi}{2} + \cos \frac{\pi}{2} = 1 \tag{2}$$

$$\prod_{i=1}^{n} i = n! \tag{3}$$

$$M \mapsto \varnothing \tag{4}$$

Notice that the equations are numbered and aligned. You can put labels on the equations and later reference them by number, i.e. consider the cool equation 2.

For references to equations, figures and bibliography to work, you may need to re-compile several times. This is because LATEXwon't see some forward-going references on the first run.

If you don't want the numbering, you would do it like this:

$$2 + 3 = 5$$
$$\sin\frac{\pi}{2} - \cos\frac{\pi}{2} = 1$$
$$n^k = \prod_{i=1}^{k} n$$

Some basics you would use right away are subscripts: $x_0, x_1, \ldots$ and superscripts: $x^0, x^1, \ldots\ldots$ By default, LATEX takes only the first symbol from an argument unless you put it in curly brackets. Beware, or you'll end up with $x^100$ instead of $x^{100}$. Armed with this, you can write polynomials:

$$p(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0$$

Another useful construct is fraction: $\frac{x}{y} \times \frac{y}{x} = 1$.

Roots are constructed as you might expect:

$$\sqrt{4} = \sqrt[3]{8}$$

A 'case' environment is used to typeset equations like this: define $f : \mathbf{R} \to \mathbf{R}$ by

$$f(x) = \begin{cases} 1, & \text{if } x \in \mathbf{Q} \\ 0, & \text{otherwise.} \end{cases}$$

Many LaTeX editors (TeXnic Center, Kyle, WinEdt, etc.) offer a GUI to select the constructs and symbols for your document, so you don't have to memorize them all.

However, the power of LaTeX is that you can define your own convenient custom easy-to-remember commands to make typesetting fun and smooth.

Now take a look how a custom command can be used to write the following:

$$a \neq 0 \Rightarrow \exists b, c, d \in \mathbf{R} \text{ such that } \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \text{ is injective .}$$

This is handy when you need to typeset a lot of matrices; e.g.

$$M = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}.$$

Operators that LaTeX doesn't know about can be typset like this:

$$F = \sum_i a_i x^{a_i} \Rightarrow \mathrm{NEWTPOLY}(F) = \mathrm{CONVEXHULL}\left(\{a_i : i \in I\}\right).$$

Lastly, if you want to typeset any symbol LaTeX normally treats as special, precede it with a backslash (*except* backslash \): $ % { :-) }.

# 3 Organization and formatting

A neat way to organize a document is by using sections and subsections. However, sometimes you might want a numbered or itemized list of items.

## 3.1 Numbered lists

You can create a numbered list like this:

1. First item

2. Second item

3. And So On...

## 3.2 Itemized lists

You can create an itemized list like this:

- First item

- Second item

- And So On...

Here, we use the command defined in the header to make a list:

- :)

- =)

- :D

## 3.3   New Page

## 3.4 Nested Lists

Of course, numbered and itemized lists can be nested:

1. First item

2. Second item

3. A new list!

   - Third First item
   - Third Second item
   - A new list!
     (a) Third Third First item
     (b) Third Third Second item
     (c) And So On...

Note how the labeling of the list items is fully automatic.

## 3.5 Skipping lines

Look at this...

...skip!

.....skip!

.....skip!
(And now, regular skip and a new page).

## 3.6 Verbatim

Sometimes one wants to include some plain text without LaTeX (mal)formatting it. For this purpose, one would use the Verbatim environment:

---

```
Whatever you type in such an environment will be displayed as monotype plain text
with all white spaces and tabs preserved and LaTeX code ignored.
One
 Two
   Three
    Four!
```

---

You can also have inline verbatim text like this: `printf("Hello World v.%d!",17)`, with regular text before and after it. This environment is convenient for little code listings, however, there are dedicated packages for that purpose that fare better (e.g. `listings` package).

## 3.7 Tables

If you need to include a table in your document, a tabular environment will do the job.

| 1 | I | can | has |
|---|---|------|--------|
| 2 | a | nice | table! |

## 3.8 Figures

You would normally use figures whenever you want to insert images or tables as figures. Figures have the nice property that you can reference them automatically in subsequent text, and that LaTeX manages their placement for you.

Now I can say tell you to take a look at the data at Figure 1, without having to change the numbering if new figures are inserted.

If you want to include graphics, do it in a vector format unless it is a photograph. A vector format stores a diagram as a set of curves and other objects

| 1 | 2 | 3 |
|---|---|---|
| 4 | 5 | 6 |
| 7 | 8 | 9 |

Figure 1: Table with important data

defined with formulas, so that the image can be scaled arbitrarily without pixellation. Common vector formats are PS (PostScript), PDF, SVG. LaTeXsupports PS diagrams when compiling into PS and PDF diagrams when compiling into PDF.

For images, one would use a raster format (encoded rectangular array of colored pixels). Common raster formats are JPEG, PNG. JPEG is preferred for photographs, PNG for everything else.

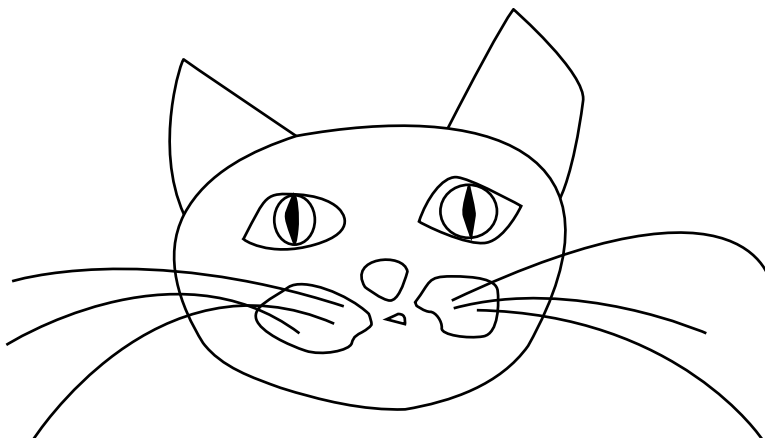For an example of graphics in a document, see Figure 2.



Figure 2: Oh hai!

## 4 Other Stuff

LaTeX also allows you to typeset bibliography in a nice format, as well as create table of contents. BiBTeX is a nice external package that does bibliography formatting for you. There are also other numerous packages

that perform different functions, from formatting equations to allowing you to typeset music scores.

However, quick bibliogrpahy references can be make like this, in case you want to cite works like [1] and [2].

# References

[1] Carle E. Linderholm. *Mathematics Made Difficult.* New York, World Pub., 1971.

[2] Stephenie Meyer. *Breaking Dawn.* Little, Brown, 2008.